

JUN 30 1924

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

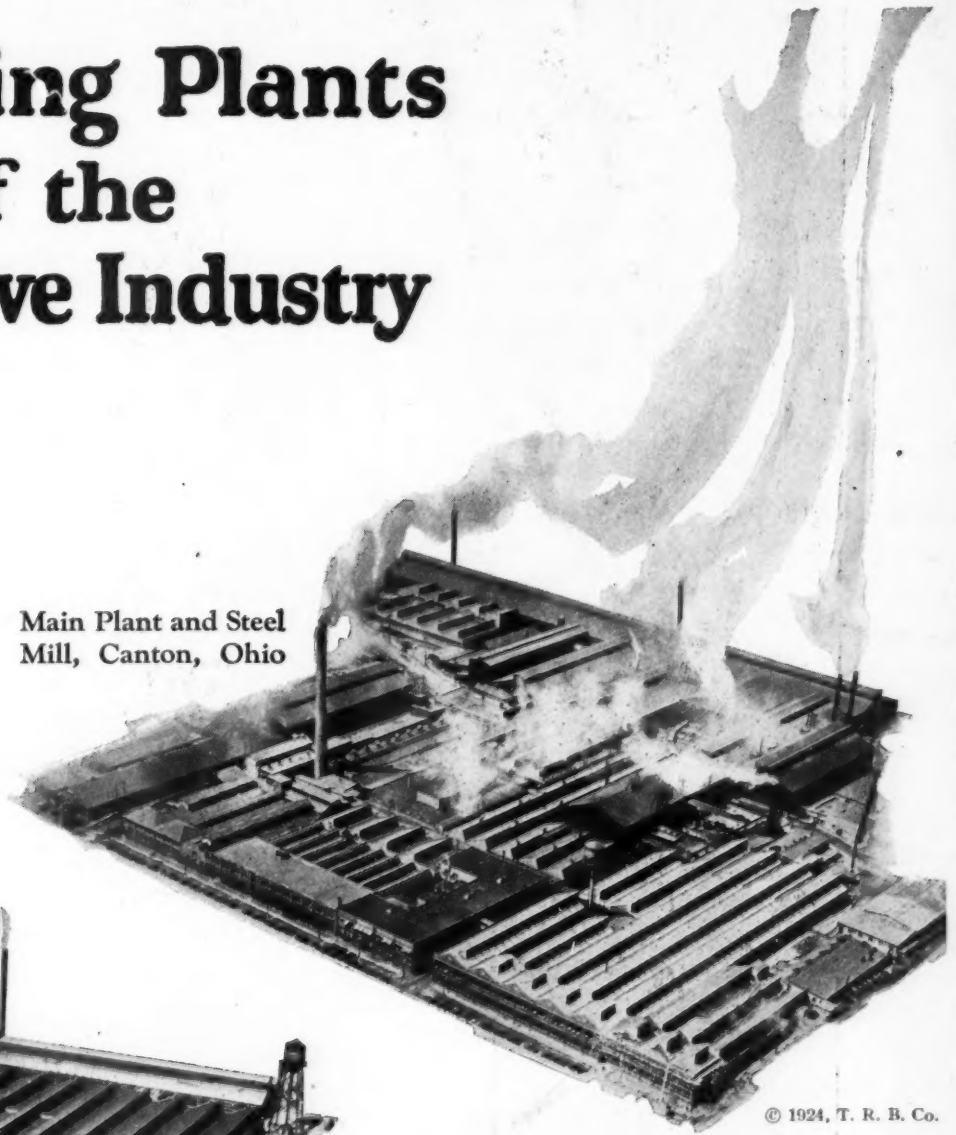
Vol. 50
Number 26

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, JUNE 26, 1924

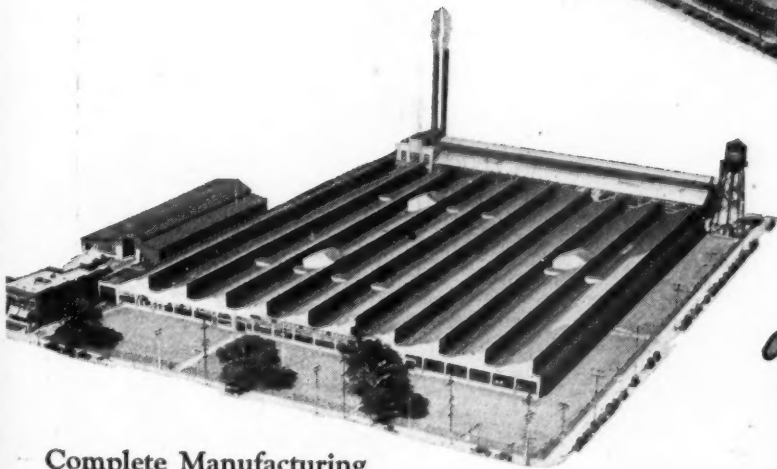
35c. a copy
\$3.00 a year

The Bearing Plants of the Automotive Industry

Main Plant and Steel
Mill, Canton, Ohio



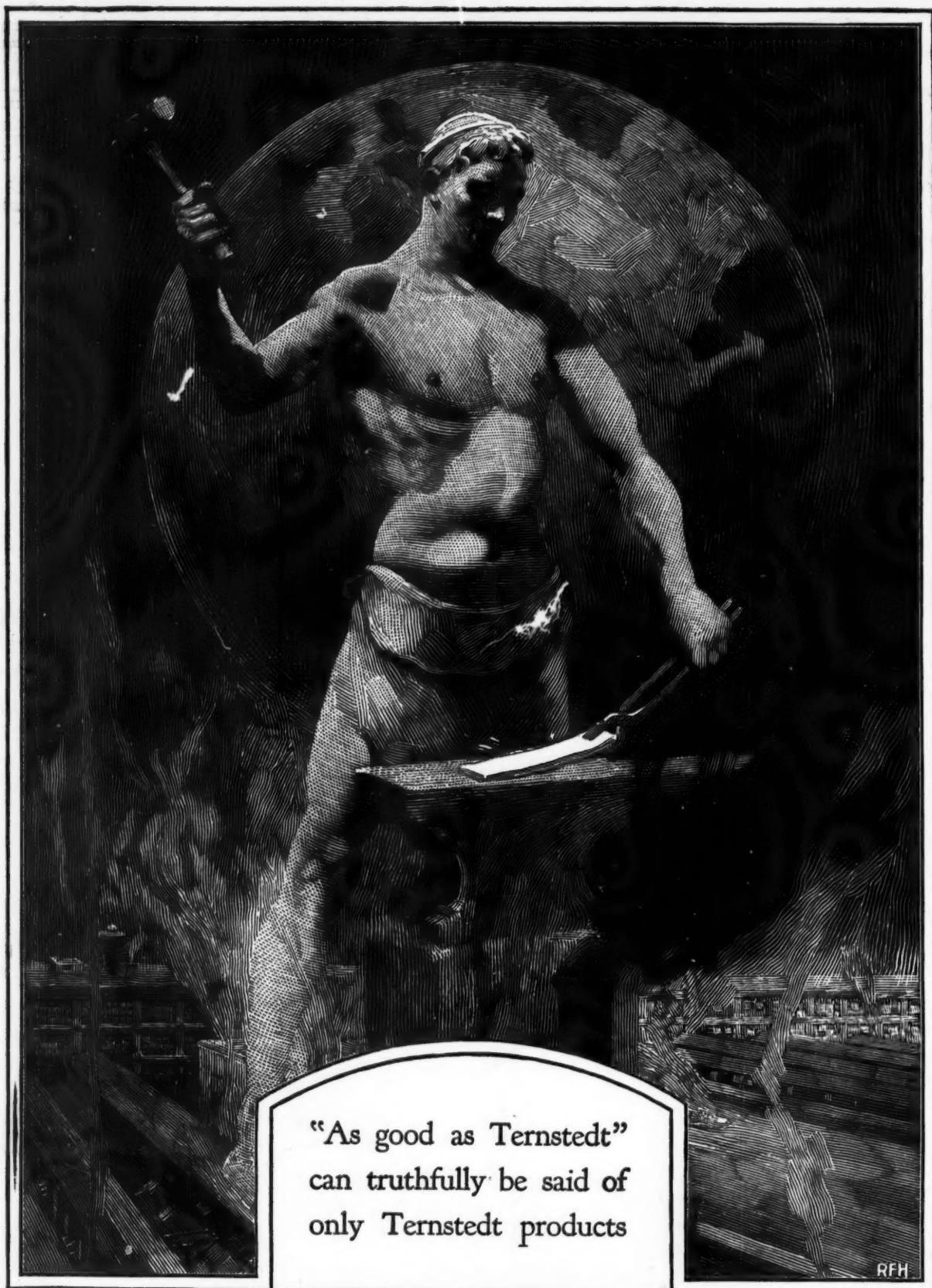
© 1924, T. R. B. Co.



Complete Manufacturing
Plant, Columbus, Ohio

Where 110,000,000

TIMKEN
Tapered
ROLLER BEARINGS
have been produced



"As good as Ternstedt"
can truthfully be said of
only Ternstedt products

TERNSTEDT

WORLD'S LARGEST MANUFACTURERS

Division of Fisher
DETROIT



OF AUTOMOBILE BODY HARDWARE

Body Corporation
U. S. A.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. 50

NEW YORK—THURSDAY, JUNE 26, 1924

No. 26

Problems Discussed from Owner's Standpoint at S. A. E. Meeting

Question of stiffer or more flexible springs with balloon tires brought up in connection with riding comfort. Oil dilution affected by the temperature of the lubricant.

By Norman G. Shidle

OVER 600 members and guests of the Society of Automotive Engineers have returned to Spring Lake this year for the summer meeting, which opened on June 24 and which will close June 27.

The first arrivals began to come in as long ago as last Saturday and a fair sized advance guard came down Monday afternoon. The meeting got under way on Tuesday afternoon when nearly 300 people went into the session on riding comfort and listened to three papers telling how to make automobiles more pleasant to ride in.

So far the sessions have been featured by the soundness and practicality of the discussions given rather than by any brilliance of presentation or novelty of ideas. The technical meetings have lacked some of the fire and dash which characterized the arguments about balloon tires and four-wheel brakes last year when these two units first took the center of the stage, but the engineers are showing a very real and detailed interest in the problems of riding comfort and oil dilution which have been up for consideration.

UP until this evening the weather man had turned on his full supply of sunshine and seemed to be trying to make up for his delinquencies earlier in the spring. Just before dinner tonight, however, he turned over his watering can and deluged the sportsmen as they were returning from the opening rounds of the athletic events. It has been so hot thus far that the women have even discarded their summer furs.

Golf, tennis and other tournaments were started today and the hotel lobbies and porches were deserted

after 2 p. m. There were no upsets in the early rounds of either singles or doubles in the tennis contests, the favorites moving ahead in each case. The golf championship will be decided by medal play this year instead of by match play as in previous S. A. E. tournaments. The qualifying rounds were played today and the low 64 players were divided into four flights for the championship test.

Other sports which began today include trapshooting, horseshoe pitching and baseball.

THE big navy blimp, Shenandoah, passed over the convention twice on Tuesday, the first time just after dinner in the evening, when it played to a large audience. Its second appearance was about 2 a. m.

Although the attendance this year is considerably smaller than it was last year, an unusually large number of interesting exhibits have been brought here for inspection by the engineers. Some of these units are not entirely new, but others are on display for the first time. A new Columbia Sport Roadster, Model 19 and a special four-wheel drive truck built by the Quartermasters' Corps, are receiving attention at the meeting.

It is evident from the papers and discussions that the technical men of the industry are studying their design problems from the standpoint of the owner to a greater extent than ever before. This is reflected in practically all of the topics chosen for the program, while individuals talking on the various questions under consideration are showing a strong tendency to consider the convenience of the car user as the basis of their discussions. The attitude was common

throughout the riding comfort and oil dilution sessions which are the only ones completed thus far.

Balloon tires came in for discussion in connection with the talk about spring design in the riding comfort session, although no special meeting was devoted entirely to the new low pressure units. Strong difference of opinion arose among the engineers as to whether springs used with balloon tires should be stiffer or more flexible than those used with the high pressure type. All seemed to agree that modifications in spring design are necessary to get the best out of balloon tires, but there was little agreement as to what those modifications should be.

Firestone is conducting experiments to determine the periodicity of balloon tires, according to James E. Hale. Results secured thus far indicate that the frequency varies directly with the air pressure and inversely with the tire section.

The oil dilution session furnished ample evidence of the complexity of this important problem and the necessity for considerable experimental work to furnish data upon which may be based a solution of the difficulties arising from dilution of crankcase oil.

Papers read at the two sessions which were devoted to this subject outlined in detail the results obtained from laboratory researches dealing with various specific phases of the general problem. One interesting point developed was that neither fuel nor water will enter the crankcase in quantities sufficient to cause serious injury if the cylinder and crankcase are maintained at suitable temperatures which are not difficult to attain under normal service conditions. A digest of the papers read at the first two sessions will begin on page 1363 of this issue.

The last two days of the meeting are being devoted to a discussion of standardization, transmissions and air cleaners.

Although rivalled for attention by the Democratic convention in New York, the decision of the S. A. E. nominating committee is being awaited with much interest. While the Democrats are making long nominating speeches and are singing the praises of their various candidates, the S. A. E. nominating committee is going quietly about its work of choosing the man best able to lead the society through the year 1925.

The three members at large of the nominating committee were chosen at the annual business meeting on Tuesday evening. The men chosen were H. L. Pope of New York, H. C. Dickinson of Washington and John Younger of Cleveland. The twelve other members of the committee are representatives elected by each of the sections. They are J. W. White, R. E. Wilson, A. O. Parker, E. Dickey, T. J. Little, Jr., F. F. Chandler, A. C. Bergmann, S. F. Briggs, A. F. Moyer, R. E. Northway, F. M. Germaine and A. W. S. Harrington.

Tribute to H. M. Swetland

The members of the society stood in silent tribute to H. M. Swetland during the business session after President H. M. Crane had read the following resolution which had been adopted by the S. A. E. Council:

"The Council of the Society of Automotive Engineers feels a great loss in the passing of Mr. Swetland.

"Just as the society and the industry benefited greatly

from his sincere cooperation and advice, so will they miss him in their further progress.

"In a large sense Mr. Swetland was the father of the society, he having been of the first to initiate its organization over a score of years ago. His friendliness and helpfulness were continuous. There never was a time when he was not most willing to give the society the benefit of his long experience and unusual business ability.

"Mr. Swetland was a member of the first council of the society, that of 1905. He was also a member of the 1923 council. As chairman of the finance committee of the society since 1910 he gave very effective advice to the Council, and the financial success of the society should be attributed largely to him.

"Mr. Swetland's greatest service was, however, not measured by his work in these capacities, but was better exemplified by his strong and intelligent leadership in the solution of broad fundamental questions that the society as well as the industry has had to meet.

"The Council of the society wishes to extend its heartfelt sympathy to the members of Mr. Swetland's family. He was a pioneer worker of an invaluable type."

The Society's Status and Activities

Reports presented at the business meeting brought out the following pertinent facts regarding the status and activities of the society:

The S. A. E. has an annual turnover of about \$300,000. Its balance of assets over liabilities is \$152,932.36.

The total enrollment of members, affiliated representatives and students on June 1, 1924, was 5532.

One hundred and fifteen applications for membership were received during May, 1924.

Nearly 1200 members paid dues to the twelve sections of the society during the last fiscal year.

There are more than 300 standards in the S. A. E. Handbook.

Men are now being placed by the S. A. E. employment service at the rate of almost one a day.

The research department has answered about 350 requests for information since Jan. 1.

At a meeting which was held here just previous to the opening of the S. A. E. convention the electrical standards committee of the Automotive Equipment Association completed recommendations for automobile wiring standards which are to be submitted to the association for a vote of approval.

These recommendations, which supplement the standards already adopted in the program of electrical generators, motors and batteries, will round out the standardization with the exception of lamps, which are to be considered in the near future.

Wire sizes and types of insulation for use with standard electrical units were adopted. In each case the size or type chosen is one of the present S. A. E. standards. In addition to this, four colors of insulation are specified for the various portions of the electric wiring circuit. The colors are red, yellow, green and black, and their adoption will assist materially in the identification of electric circuits in the repair or service shops.

Papers on the subjects discussed at the first two sessions follow.

FOLLOWING this preliminary report which tells how the summer meeting of the Society of Automotive Engineers started and what happened during the first few days, there will be a complete report of the sessions and of the big ideas developed by the engineers during their discussion at Spring Lake in next week's issue.

S. A. E. Summer Meeting

Consumption and Dilution of Engine Oil

Tests made on five 7½-ton Mack trucks in regular service using the same grades of oil and fuel show wide variance.

NEIL MACCOULL in his paper on Consumption and Dilution of Engine Oil described road and dynamometer tests made by the Texas Company. The road tests were made on five 7½-ton Mack trucks in regular service. Although the same grades of fuel and lubricating oil were used, the rate of oil consumption varied enormously. The gasoline mileage also varied, from 2.2 to 3 per gallon, but not consistently with the oil consumption. The only variable that seemed to be related to the dilution was the rate of oil consumption. Plots of the data obtained showed that the dilution reaches a maximum after a comparatively short time and that thereafter there is no further change in the viscosity of the crankcase oil.

Rather than determining the actual dilution by the distillation of each sample, the viscosity of the oil is measured and from this the dilution is determined with the aid of a curve. It was found that the diluent removed from the oil by distillation is practically the same in all cases, and Fig. 1 shows the limiting and average distillation curves. One of the five trucks showed a much lower oil consumption than the rest and this suggested finding out why there was this difference. This led to the dynamometer experiments which were made on a Waukesha four-cylinder 4½ by 6 in. engine which had seen a good deal of service.

A number of special features were introduced in the set-up. By blocking the oil-pressure regulating bypass valve, the regular oil pump was made to serve as a meter, showing the rate of oil circulation through the crankshaft bearings. The pump was placed outside the crankshaft at the front and provided with change gears, so

its rate of delivery could be controlled. Another change in the engine consisted in providing it with a double-walled-sheet metal oil pan, with steep sloping walls for the rapid draining of oil. Water was circulated through the jacket constituted by the double walls, which permitted of controlling the oil temperature.

A dry sump system of lubrication was used, all of the oil being drained from the oil pan into a glass graduate, from which latter the oil was drawn by a pump. A routine test consisted of a two-hour run during which all of the conditions decided upon for the test were kept as nearly as possible constant. Observations were taken every five minutes and data were plotted of the total oil drawn from the graduate, the oil pressure, crankcase temperature and engine torque. The oil viscosity was determined every half hour. Some irregularities in the results were found to be due to the shifting of the piston rings in their grooves so as to bring the gaps in all of the rings in line, and to eliminate this factor the rings were pinned.

Conditions Under Which Runs Were Made

The standard conditions under which the runs were made were as follows: Speed, 700 r.p.m.; Load, manifold depression 7 cm. mercury; Spark, 35 deg. advance; mixture, Jet No. 55; Temperatures: Carbureter air, 200 deg. Fahr.; Cylinder Jacket water, out, 100 deg. Fahr.; Oil sump jacket, in, 100 deg. Fahr.; Resultant crankcase temperature, 130-140 deg. Fahr.; Fuel, auto gas (navy specifications); Oil, 500 in. viscosity, pale filtered.

Only one of the variables was changed at a time, all others being held constant.

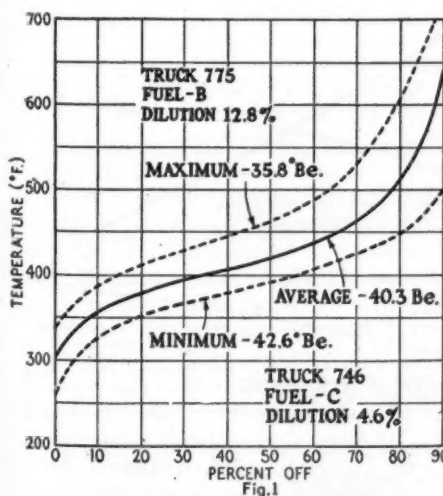


Fig. 1—Extreme and average distillation curves of diluent removed from crankcase oil

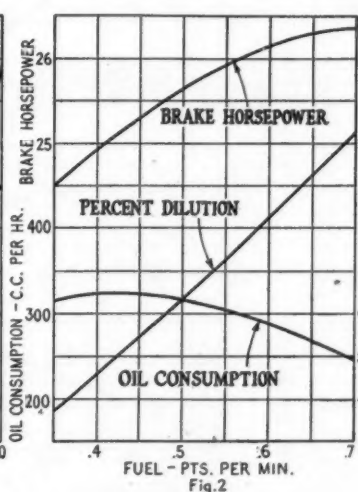


Fig. 2—Effect of mixture proportion on power output, rate of dilution and oil consumption

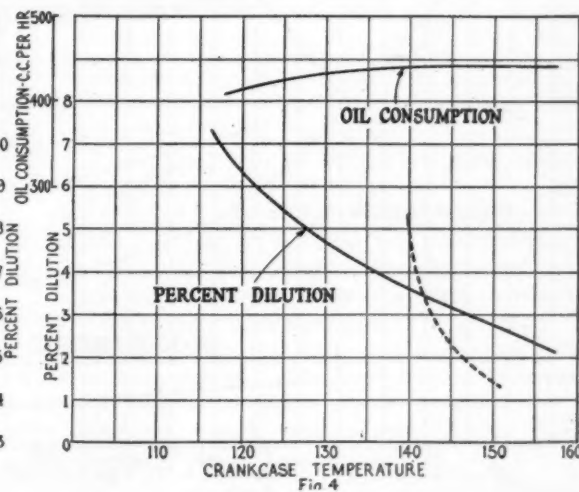


Fig. 4—Effect of crankcase temperature on oil consumption and dilution

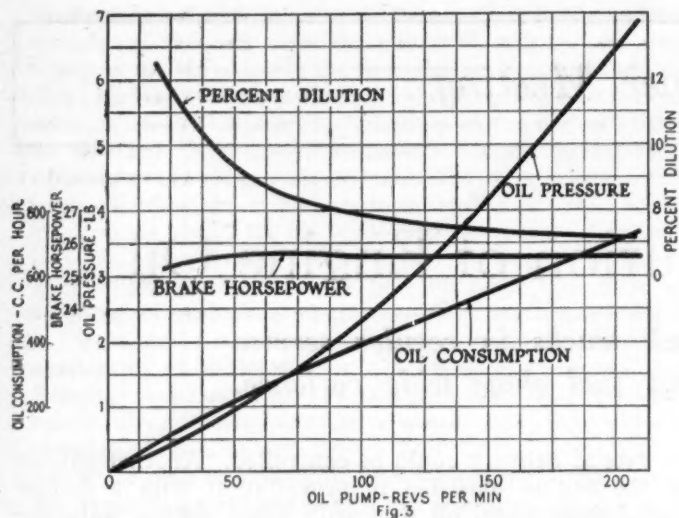


Fig. 3—Effect of rate of oil circulation on power output, rate of dilution, consumption and oil pressure

Fig. 2 shows the effect of mixture ratio on the oil consumption and the rate of dilution. It will be seen that the rate of dilution increases rapidly with increasing mixture richness, whereas the oil consumption is cut down, but this is probably due largely to the fuel entering the oil, for which no correction was made.

Both the oil consumption and the rate of dilution increase with an increase in power output due to opening of the throttle, but the rate of increase is not as high as that of the power output.

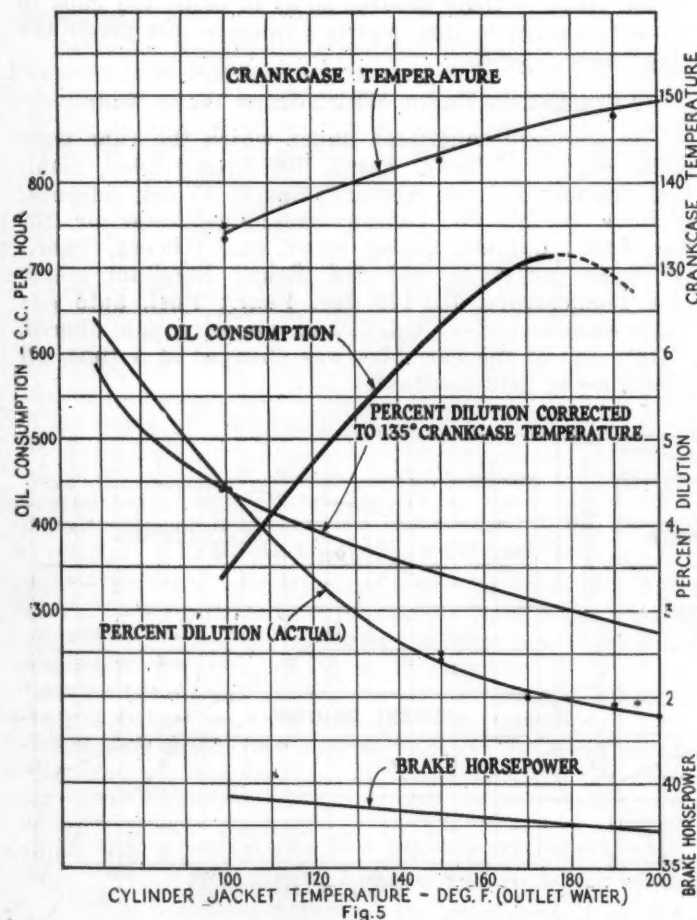


Fig. 5—Effect of jacket water temperature on oil consumption and dilution

By means of the change gears on the oil pump the rate of oil feed to the bearings was varied and the effects on the rate of dilution, oil consumption, oil pressure and horsepower were studied. The results are shown in Fig. 3. It will be seen that the oil consumption increases in almost direct proportion to the rate of circulation, while the pressure increases as the square of that rate. There is no appreciable effect on the horsepower within reasonable limits of oil consumption, but the dilution drops quite rapidly as the rate of circulation and hence the consumption increases.

These results brought up the question as to what is the most desirable rate of oil consumption, and Mr. MacCoull says that this problem will be investigated at a later period.

Temperature Affects Dilution Most

It was found that the factor having the greatest influence on the rate of dilution is the crankcase temperature. Not a very great variation in this temperature was possible with the means at hand, but it was shown that an increase of only 35 deg. Fahr. reduced the dilution by one half. From the shape of the curve it appears that the dilution increases still more rapidly at lower temperatures. In this connection it is worthy of note that in winter it takes sometimes as long as two hours before the crankcase of a truck that has stood out of doors or in an unheated garage all night attains its normal temperature. Mr. MacCoull intimates that the practice of providing the oil pan with cooling ribs is all wrong, as the cooler the oil the more rapid the dilution.

It has been noted that there is usually very little dilution of the crankcase oil in dynamometer runs, and this

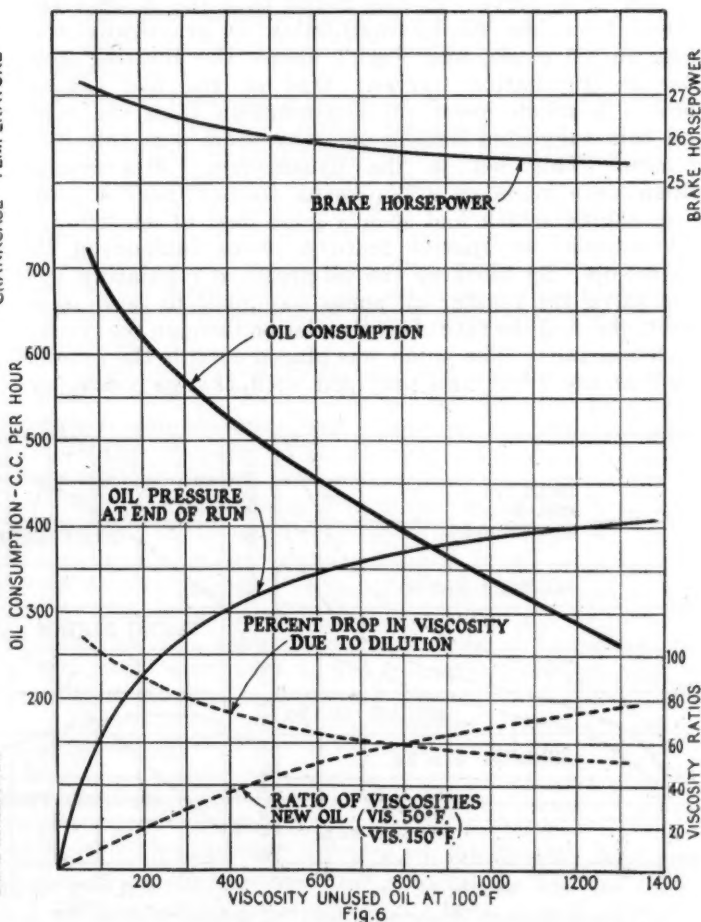


Fig. 6—Effect of initial viscosity (at 100 deg. Fahr.) on power output, oil pressure, consumption and dilution

is no doubt due to the high temperatures attained by the crankcase in such runs, sometimes as high as 200 deg. Fahr. The only objection to crankcase temperatures of 150-200 deg. Fahr. is a slightly greater oil consumption, due to the fact that more oil is thrown on the cylinder walls when the oil is hot, and therefore thin.

A difficulty was encountered in trying to determine the effect of variations in jacket water temperature on the rate of dilution, in that the crankcase temperature varied with the jacket temperature. Fortunately, the range in crankcase temperatures was not great, and in Fig. 5, which shows the effect on the dilution of cooling water temperature changes, an extra curve is drawn in which the effects of crankcase temperature variations have been corrected.

Other results of the variation in cooling water temperature were a consistent decrease in output with rise in cooling temperature and an increase in the oil consumption up to a cooling water temperature of 180 deg. Fahr. and a decrease thereafter, for which no explanation has yet been found. Mr. MacCoull mentions changing piston clearance as a possible reason for the decrease in output with increase in jacket temperature, but we believe it has been pretty well established that decreasing volumetric efficiency is the real reason.

The last series of tests related to the effect of initial viscosity of the oil on power output, oil consumption, oil pressure at end of run and proportional drop in viscosity at 100 deg. Fahr. due to dilution. Five oils were used in this test, all distilled from the same crude, but varying in viscosity from 100 to 1300 seconds Saybolt.

Viscosity and the Grades of Oil

As would be expected, the oil consumption was the greater with the lighter oil. On the other hand, the oil pressure at the end of the run did not go up with the initial viscosity as much as would be expected, which is no doubt due to the fact that the proportional dilution by fuel is greater with heavy oils. The loss in viscosity is expressed as the proportion between the viscosities

of the old and the new oil, and it will be seen that in this respect the light oils show up the best.

The greatest power was obtained with an oil which had a viscosity of less than 40 seconds Saybolt at the cylinder temperature and 60 seconds Saybolt at crankcase temperature. There was nothing to indicate that lubrication with this oil was not entirely satisfactory, though, of course, the engine did not run quite as quietly with it as with the heavier oils.

Conclusions Which Can Be Drawn

Following are some conclusions drawn from the experiments carried out to date:

1.—Crankcase dilution can be reduced to an unimportant factor by keeping the crankcase warm. High-water temperature also assists in reducing dilution.

2.—An excellent lubricating system can be produced by eliminating the present function of the oil by-pass valve as a pressure regulator and using it only as a safety valve, at the same time reducing the pump capacity to the rate of flow desired through the bearings. This system, in which all effects of changing bearing clearance, oil viscosity and temperature on the rate of oil supply are eliminated, has proved its practicability on the Mercedes and Renault cars and on airplane engines.

3.—One of the reasons for marketing a series of motor oils of different viscosities is to permit control of the oil consumption within certain limits. If the consumption appears too great, a heavier oil is used, while if it is exceptionally low, a lower viscosity oil is not only satisfactory but probably preferable for other reasons. Hence grades of different viscosities are resorted to in order to compensate for those mechanical differences in engine conditions which determine the oil consumption. Almost the same results could be secured by varying the oil pressure.

4.—Both oil consumption and dilution are influenced by many factors, and road tests in which such items, for instance, as crankcase and cylinder temperature are not ascertained, are of little analytical value.

Handicaps Overcome in Present Oil Rectifier

Device which has now been put in production is the result of several years' development and the discarding of former designs.

R. L. SKINNER presented a paper relating to experiences with the oil rectifier of his invention, which was described and illustrated in AUTOMOTIVE INDUSTRIES of May 15. The device, which has now been placed in production, is the result of several years' development, having been preceded by other designs which proved unsatisfactory for one reason or another, and Mr. Skinner gave a brief account of his experiences with these earlier devices.

In the first device oil was drawn off from the crankcase by the inlet vacuum and passed through a heater in the exhaust manifold to a trap, from which the refined oil was returned to the crankcase and the diluent taken into the intake manifold. The chief objection to this arrangement was found to be that on short trips, when the increase in dilution is most pronounced, there is not sufficient heat available to drive off the diluent already in the oil. Another objection was that after from 15 to 20 per cent dilution had accumulated, it was

necessary to handle the whole amount of crankcase oil from ten to fifteen times to bring the viscosity back to normal. Owing to the high temperature required to drive off the heavy ends of the diluent, trouble was experienced from coking.

In the next attempt the oil was removed by suction from the lower ring groove when in the lowermost position and passed through a heater in the exhaust manifold to a separator of the same type as used in the first experiment. While this arrangement gave good results on the dynamometer, it was very unsatisfactory when mounted on a car, owing to the fact that a large proportion of the separated gases would condense in the separating chamber, which was subject to the cooling blast of the fan, and would be carried back to the crankcase.

In the next device the heater was combined with the separator. While this gave splendid results, it also gave trouble. When the engine was highly loaded for

a considerable period, and therefore attained a high temperature, a large amount of carbon was formed and the viscosity of the oil was increased. By inserting a trap between the device and the inlet manifold connection, in which a portion of the vapor driven off was condensed, it was found that a large portion of the condensate consisted of the lighter fractions of the lubricating oil.

After considerable experience a thermostatically controlled valve was provided, which at a predetermined temperature shuts off the heat supply, so that the oil removed from the engine cannot be subjected to an excessive temperature. This thermostatic valve is embodied in the device now in production.

The amount of oil passing through the device varies with the piston clearance and the method of lubricating the piston pins. In an eight-cylinder, V type engine a quart of oil is handled every 5 to 7 miles at ordinary touring speeds and with 0.0025 to 0.003 in. piston clearance, while in a straight eight engine in which oil pipes lead up the connecting rods to the piston pin bearings, a quart is handled every 2 miles. There are approximately six operations per quart of oil handled. All of the moving parts of the device operate in oil, hence the wear should be very slight.

When coasting or with the engine throttled for other purposes, the vacuum on the piston is from 17 to 23 in. of mercury, while when operating under full throttle it is, of course, much less.

It has been found that the longitudinal groove in the side of the piston should be made as long as possible, to prolong the vacuum period on the ring groove. No trouble is experienced from the vacuum removing too much oil from the ring groove and causing under-lubrication of the upper end of the cylinder.

Make Comparative Test

In a comparative test with and without the device, in which the engine was operated under 15 hp. at 800 r.p.m. for twelve hours, the crankcase oil decreased in viscosity from 350 to 340 with the device and from 350 to 231 without it. Without the device the dilution will begin on an average at 229 deg. Fahr., whereas with the device no dilution will occur below 350 deg. Fahr.

With the device on the engine crankcase oil dilution is kept down to a minimum, and this is claimed to result in many advantages. With the Ford engine, for instance, the operation is much greater and the chatter of the bands observable with greatly diluted oil is entirely eliminated. The bands are claimed to last much longer without adjustment.

By preventing the blow-back into the crankcase, water accumulation in the crankcase is eliminated, and this prevents corrosion. By preventing the oil from working upward into the combustion chamber the formation of carbon deposits is prevented to a large extent.

The claim is made that excessive engine wear is generally due much more to oil dilution than to dust drawn in with the carbureter air. As regards dust, the conditions in automobile operation have constantly improved, considerable proportion of our roads now being dustless, and the carbureter air intake being located a good deal higher than it was when the fuel feed was still by gravity. In substantiation of this claim the following two tests are cited:

First Test Made on Tractor

The first test was conducted in California on a 65 hp. tractor using motor distillate for fuel. Prior to the installation of a device, dilution was so rapid that after

the tractor had been run five hours the crankcase, which held eight gallons of oil at the proper level, had to be drained of two gallons to reduce the oil to the required level. After repeating this three times, the practice was to drain the crankcase and put in a new supply of oil. No oil was added to the supply between changes. Under these conditions, even during the month of November, December and January, when a minimum amount of dust was encountered, it was necessary to tighten the connecting rod bearings at least once a week, and sometimes every ten days. The wear on the piston rings and the grooves was so great that new rings had to be put in the engine, even though it was new when the test started, within sixty days.

Operated Under Same Conditions

The device was installed on this tractor on Feb. 1, without change of pistons, rings or any engine parts, and the tractor was thereafter operated under exactly the same conditions. Instead of drawing off oil from the crankcase, however, it was necessary to add two quarts every ten hours. The tractor was run 200 hours in plowing, then 150 hours in harrowing (which is about the worst condition imaginable), or a total of 350 operating hours without changing the oil. The connecting rod bearings required no attention even though they were examined very often in the first few days. They were tightened at the end of this time. The tractor was next used to pull a harvester for 55 days, most of the time operating 12 to 14 hours under the worst possible dust conditions, during which time the oil was changed twice.

Thus after the installation of the device, and the consequent reduction in the dilution even with motor distillate, the tractor was operated in excess of 900 hours, and during the entire period no adjustment of the main bearings was required. This tractor has been operating now for over three years, during which time the crankshaft has never been removed from the engine for grinding. The cylinders were replaced in 1922, due to an unexpected cold snap that froze and cracked them, making their repair impossible. During both tests the engine was equipped with air cleaners on both the carbureter intake and the breather.

The second test was a comparative dynamometer test in the East on two automobile engines, one equipped with the device and one without it, gasoline being used for fuel in both tests. The engine speed was maintained at 2000 r.p.m., equivalent to 40 m.p.h., pulling a load of 12½ hp. This closely approximated the power required to drive a touring car at a consistent speed of 40 m.p.h. on a level road.

Equivalent to a Distance of 10,000 Miles

The engine equipped with the device was operated 250 hours, or the equivalent of a distance of 10,000 miles, during which time the crankcase oil was not changed and only 30 quarts of oil were consumed. The engine without the device was run the same length of time and miles and the crankcase oil was changed every 500 miles; between oil changes it was necessary to add 30 quarts of oil, hence a total of 130 quarts of oil were used. Every hour during the entire operation of both engines a teaspoonful of dust was injected into the carbureter.

An average oil mileage of 1288 miles per gallon was obtained on the engine with the device against 308 miles on the engine without the device. Bearing trouble was encountered on three occasions on the engine without

the device, whereas the engine with the device was run throughout the test without an adjustment or repair, save the replacement of a cracked porcelain in a spark plug.

New Variable Speed Transmission

A PAPER on The Weiss Variable Speed Power Transmission dealt at length with the transmission invented by Carl W. Weiss, which was described in AUTOMOTIVE INDUSTRIES of March 20. The following advantages are claimed for this transmission:

It is highly efficient and is not subject to great wear as all the power is transmitted through ball bearings, of which the efficiency and durability are well known.

It is positive in its transmission of power for all speed ratios and for all loads.

It maintains constant, uninterrupted action during all speed variation, for the driven and driving elements are in constant contact.

The torque does not react on the speed control mechanism.

The torque radius of the driver and that of the driven element are equal and remain constant at all speed variations.

The torque capacity increases approximately as the cube of the diameter of the transmission.

In the zero position the driven element is at rest and is locked against rotation in either direction without angular reaction on the driving element or upon the control, regardless of the speed of the driving shaft.

This transmission makes possible continuous or curve speed changes, the speeds varying from zero to maximum, which gives it great advantage over both gear and friction transmissions.

The foregoing characteristics open the way to automatic torque control through use of what may be termed a torque governor. The proper reduction ratio is then obtained automatically through torque reaction on the speed controlling member.

Tests Made for Efficiency of Air Cleaners

Necessary suction was produced by means of an air jet and air velocity was adjusted by means of a Venturi meter.

IN the paper on Testing of Air Cleaners by A. R. Squyer, a new method of determining the efficiency of these cleaners was described. It was discovered that a filter of soft felt $\frac{3}{8}$ in. or more thick removes all of the dust carried by air passing through it and, therefore, has an efficiency of 100 per cent as a dust remover.

A cleaner making use of $\frac{5}{8}$ in. soft felt was interposed in the air line between the cleaner and carburetor, the filter being so arranged that it could be removed and weighed (Fig. 1).

In making a test, the necessary suction was produced by an air jet instead of by the engine, and a Venturi meter was inserted in the line by which to adjust the air velocity. Pure atmospheric air was forced through the filter until the weight of the felt became constant; then 50 grams of dust was fed into the cleaner, and from

the increase in weight of the felt filter the efficiency of the cleaner was calculated.

The cleaners which showed up best in this test were then checked on an engine under load on a Sprague dynamometer. Any loss in power of the engine as a result of the use of the cleaner was determined, as well as the water consumption of the washer type air cleaners.

In the concluding portion of the paper is given some rather useful advice regarding the choice and care of air cleaners. The author observes that operators, as a rule, do not exercise the necessary care with this apparatus. In one particular case a tractor was equipped with a cleaner of the water type, in which a float was installed, which automatically choked the carburetor inlet and thereby stopped the engine, when the water

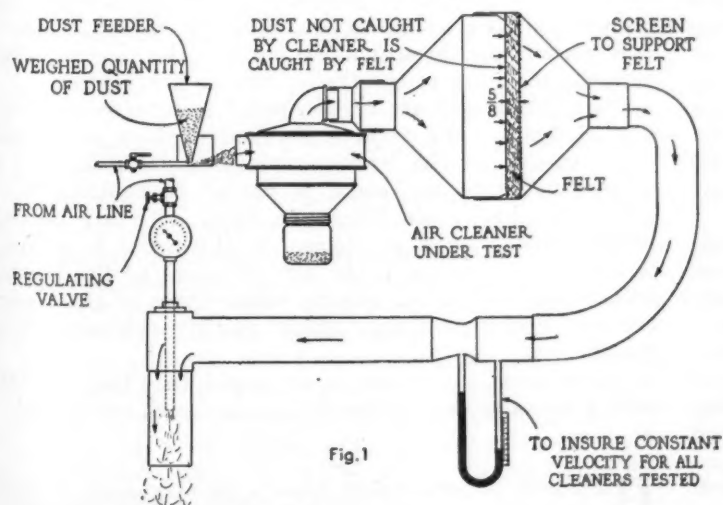


Fig. 1—Set-up of apparatus for efficiency tests

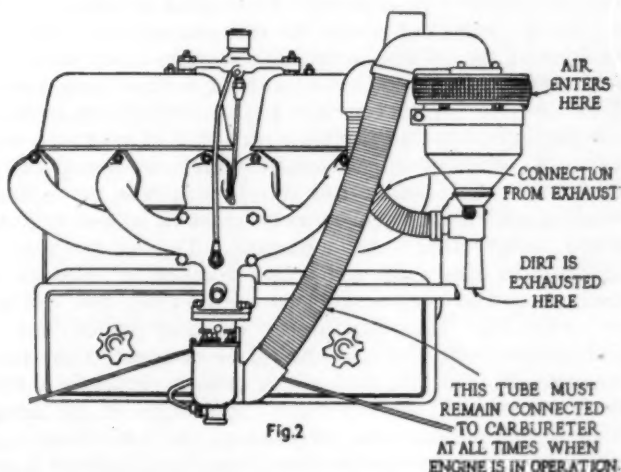


Fig. 2—A good air cleaner installation. Flexible tube soldered to carburetor and cleaner. Gasket under flange on top of cleaner

reached a certain low level. The operator therefore had to replenish the water supply before he could continue.

One day it was discovered that the float was held up by a wedge and that there was no water in the cleaner. Upon being questioned the operator stated that he could not be bothered with feeding water to that blankety blanked cleaner all the time; that it was a nuisance.

Air cleaner designers must give thought and study to this phase of the problem as well as to the requirement of efficiency. A storage battery ordinarily requires that water be added once a week and no really serious damage results if a week be missed. The user has learned to recognize this, and his battery is seldom neglected. An air cleaner positively should not require attention oftener than once a day under the most severe dust conditions of tractor operation; if this can be extended to once a week or a month or indefinitely, so much the better.

Conditions Vary Usage

One manufacturer equips his tractors, ordinarily, with a dry centrifugal cleaner, which ejects the dust as fast as it is separated. This, in general, requires no attention from the operator. It has no moving parts to wear out. The efficiency of this cleaner is 97 per cent. Another cleaner, of the filter type, has an efficiency of 98.5 per cent, but under extremely dusty conditions it will become so filled with dust as to seriously choke the carburetor inlet before the end of a working day. A full half hour is required to wash this cleaner out with gasoline or kerosene and to re-oil the filtering medium.

The filter is sometimes furnished as extra equipment for bad conditions, where the 97 per cent efficiency of the centrifugal cleaner is not considered sufficient. In these cases, both cleaners are used in series. The centrifugal removes the first 97 per cent, and in this way the filter is relieved to such an extent that it can easily go a week without attention. The filter is very efficient in absorbing the very fine dust which escapes the centrifugal cleaner. The combined efficiency of the two is in the neighborhood of 99.9 per cent.

Method of Attachment Important

The method of attachment is also very important, in that it makes for the success or failure of a cleaner. Installations have been observed in which the hand could be placed over the cleaner inlet while the engine was pulling full load and the mixture was only slightly enriched, and the load was still nine per cent of maximum. A poor grade of flexible tubing was used to connect the cleaner to a stove. The same grade of tubing was used from the stove to the carburetor. All connections of the tubing were sloppy. The stove was loosely fitted to the exhaust pipe, so that a crack aggregating 15 in. in length and roughly 1-16 in. wide was evident.

A cleaner installed in this manner is of no value whatever. A tube should be used which is positively air tight. The end connection should likewise be tight. A practice which has proven very good is to use standard flange connections throughout. These flanges are soldered to the tube and copper-asbestos gaskets are inserted at the connections to the cleaner and carburetor (Fig. 2). If a carburetor be used which has two air-intakes, both of these should be connected to the air cleaner. If this clarified air is drawn through a stove, the latter should be air tight. Leakage of air around loose joints defeats the purpose of the air cleaner.

Minimum power loss is one of the essentials of a good air cleaner and this must, in a measure, be balanced against the other two—high efficiency and ability to operate without much attention. It may be wise, in a

particular case, to accept a small loss in power, provided the cleaner is efficient and requires little or no attention to insure its continuous functioning. In one case the intake manifold vacuum increased from 2.5 in. to 3.5 in. of mercury, with the addition of the cleaner, and the horse power decreased from 42 to 40. Of course, the mixture must be readjusted for best results when the cleaner is attached.

In the case of a water cleaner, a slight power loss was observed when the tubing was attached to the carburetor, but when the cleaner itself was attached, although the vacuum increased from 2.2 to 2.7 in. of mercury, there was no decrease in power because of the increased combustion efficiency, due to the moisture from the cleaner. This cleaner also showed an efficiency of 98 per cent, but under heavy load the water would not last throughout a working day without replenishment.

The bulk of the cleaner is also a point worth consideration. The device must not be an eyesore, and if it requires attention it must be accessible.

Air-Braking System for Trailers

AN air-braking system for motor trucks and trailers has been developed by the Knorr Brake Co. of Berlin, a concern which has long been engaged in the manufacture of air brakes for railroad rolling stock. In this new system air is pumped by means of a compressor mounted on the gearset and driven from the tailshaft of the latter, so that it is in operation as long as the truck is moving.

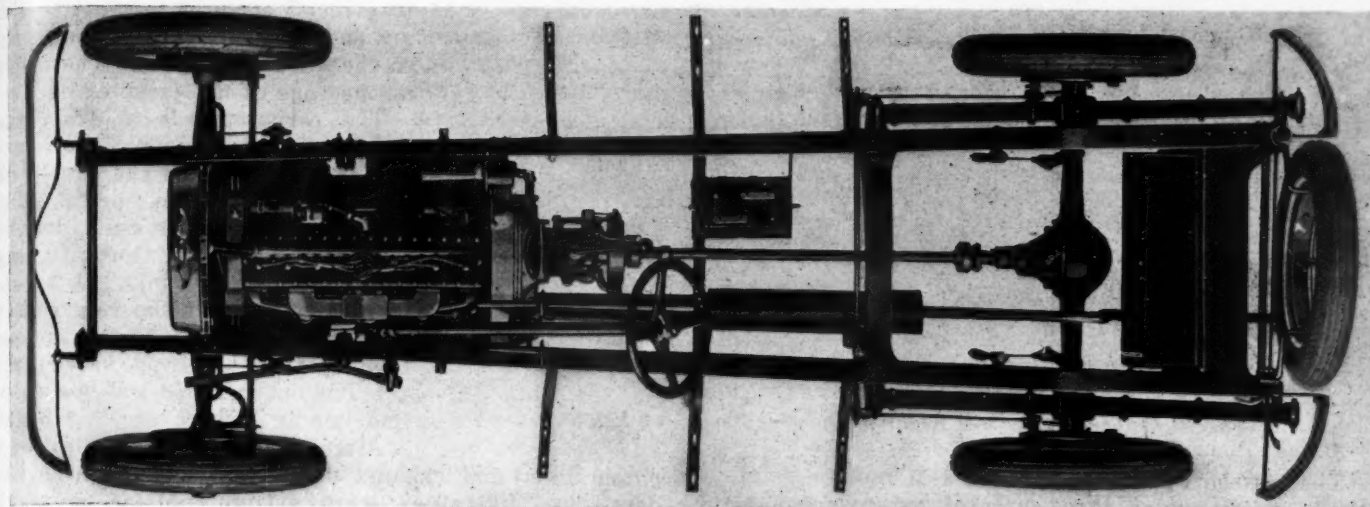
Since much greater braking power is required when the truck is loaded than when it is empty, a dual pressure regulator with two regulator springs is provided, which can be set for low pressure when the truck runs empty and for high pressure when it is loaded. This same compressor can be used as a tire pump in case the truck is fitted with pneumatic tires by merely placing both of the regulating valves under pressure so they cannot open.

Brakes are provided on all four wheels and operated by means of air cylinders secured to the axle near the brake drum. The brakes are applied by means of a pedal and there are four positions of this pedal which are made distinctly noticeable through the action of spring plungers. Ordinarily the pedal is held in position 1 by the return spring. If it is desired to brake lightly, the pedal is pushed to position 3, with the result that the various air lines to the brakes of the tractor are slowly filled with air through small ports of the control valve, whereas the lines to the trailer brakes are vented.

Once the brakes are on the pedal is returned to position 2, in which the ports of the control valve are closed, the pressure on the brakes remaining the same. For emergency stops the pedal is moved to position 4, in which the brake air lines are filled with air quickly through large sized passages. If the pedal is allowed to return to position 1, the air cylinders of the tractor will be emptied of air quickly while those of the trailer are put under pressure, which quickly releases all of the brakes.

The trailer brakes are so arranged that they go into action automatically if the trailer becomes uncoupled.

BBRITISH papers report that a new type of internal combustion engine now being tested at the works of J. W. Brooke & Co. at Lowestoft runs at 4500 r.p.m. and weighs 5¾ lb. per hp., the output being about 50 hp.



Showing the plan of the Rickenbacker eight-cylinder chassis with front and rear bumpers and spare tire attached

New Rickenbacker Vertical Eight Will Supplement the Six

Airplane type of oil tubing, radiating fins on cast aluminum oil pan, cold blast for cooling oil in summer, duplex carbureter and camshaft always immersed in oil are features.

By J. E. Schipper

A NEW car with an eight-cylinder engine has been added to the Rickenbacker line and is now in production. Known as the Vertical Eight, it will supplement the six, which will continue to be the backbone of the line. Three body types, a sport touring at \$2,195, a coupe at \$2,695 and a sedan at \$2,795, will be supplied on the standard 121½-in. wheelbase. Four-wheel brakes, oil rectifier and air cleaner are included in the standard equipment, while balloon tires are optional at an extra charge of \$100.

High acceleration or a quick get-away is one of the outstanding characteristics of the new car. With cylinder dimensions of 3 x 4¾ in. and a compression ratio of 4.76 to 1, an output of 70 hp. at 3000 r.p.m. is secured. This is one horsepower for each 3.83 cu. in. piston displacement, the total displacement being 268.56 cu. in.

A number of unusual features are incorporated in the design, and particularly in the engine. Some of these bear the stamp of the Rickenbacker air experience, such as the airplane type of oil tubing, radiating fins on the cast aluminum oil pan, cold blast for oil cooling in summer and the duplex carbureter.

What is probably the most radical engine feature is the location of the camshaft in an oil-tight compartment separate from the crankcase, where it is completely immersed in oil at all times. In practically all other engines the camshaft is oiled by the spray from the crankshaft and rod bearings.

Like other eight-in-line engines, the Rickenbacker is arranged as a central and an outside four. However, the division into two fours is carried farther than in

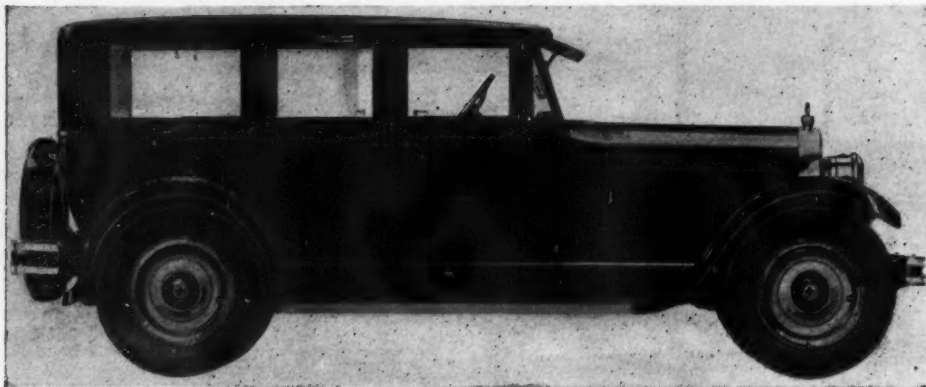
other types, in that the engine is also "carbureted" and fired as two fours. The manifolding to each four is made separate to prevent overlapping, and each manifold is designed so the passages from the carbureter to the four cylinders all have the same resistance to gas flow, to insure uniform distribution.

The eight cylinders are cast in the form of an L-head block, while the heads form a separate casting which is formed with combustion chambers of such shape as to induce a certain degree of turbulence. Over the valves the combustion chambers are domed, and they taper down to a small clearance on the opposite side. To insure uniformity of compression the chambers are machined by an eight-spindle automatic contouring tool. The spark plugs are located over the inner sides of the intake valves. There is a deep water space in the head over the combustion chamber and around the spark plugs.

As in the six, gray iron, three-ring pistons with adjustable piston pin bushings are used. The adjustment is made by means of a clamp bolt in the upper end of the rod.

Crankshaft Is Supported in Nine Bearings

The crankshaft is supported in nine bearings and the webs on bridges which act as the bearing support add materially to the rigidity of the block. The oil pan also acts as a structural member to a certain extent, the ribbed cast aluminum contributing to the stiffness of the assembly. All bearings are of the flanged type. Two fly wheels are employed, one at each end of the crankshaft, the design in this respect being similar to the six.



The Rickenbacker Vertical Eight sedan which sells for \$2795

The camshaft is driven through a Morse $2\frac{1}{2}$ -in. silent chain, a triangular three-sprocket arrangement being employed, the third sprocket taking care of the generator and water pump. The crankshaft sprocket has 20 teeth, the camshaft 40 and the generator 15. The camshaft is supported in eight bearings, held in webs in the camshaft compartment. The oil level in the camshaft compartment is such that the entire camshaft is completely immersed. Oil is fed to this compartment both by the oil relief valve and by the splash, and it overflows back into the crankcase. Not only the camshaft but also the mushroom ends of the tappets are always immersed in oil, and the valve stems are subject to a constant spray of oil, which helps to keep them cool.

On the left side of the engine there is a cast aluminum plate, and when this is removed the entire valve mechanism, including the tappets, springs, and camshaft, is exposed and the tappet guide assemblies can be removed. For tappet adjustments it is not necessary to remove this cover, as there are small hand holes in the large plate which can be quickly opened by turning six thumb screws. This permits adjustment of the tappets without draining the oil from the camshaft compartment.

The valve stems are inclined at an angle of 3 deg. to the axis of the cylinder. The valves are of $1\frac{1}{2}$ -in. nominal diameter, with $\frac{3}{8}$ -in. stems. The valve springs for both inlet and exhaust are under 45-lb. pressure and the tappet clearance is 0.008 in. The valve tappets are carried in demountable blocks in the same manner as in the six. Each end block in the eight carries six tappets and the center block four. The center block also carries a bevel gear which drives the oil pump and the ignition distributor, and a ball thrust bearing to take up the end thrust due to this gear, these parts being mounted on opposite ends of a vertical shaft located at the center longitudinally.

Oil Pan Is Cast Aluminum with Fins

The oiling system on the eight is similar to that on the six, except for the fact that on the new model there is a cast aluminum oil pan with radiating fins. Another provision for cooling the oil by means of the cold air passing to the carburetor is also introduced on this model. This oil cooling system is used only in summer, when the dash regulation is in the "summer position" and cold air admitted directly to the carburetor. In winter, hot air is taken into the carburetor and the oil cooling device is not used.

There are two passages for the air from the air cleaner to the carburetor, both formed in a single casting, and by means of a two-way valve the air can be passed through one or the other. A short section of one of these passages is surrounded by a jacket, and by leading the hot engine oil through this jacket it is caused

to give off some of its heat to the air passage wall and consequently to the air flowing past. The other air passage is not jacketed.

The carburetor is a dual type Zenith with fixed jets. There are two feed tubes from the fuel tank to the vacuum system, one tube terminating at a lower point in the tank than the other, thus insuring a 3-gal. reserve supply. A three-way valve controls the reserve. In the event of a leak in the main line, turning the three-way valve cuts that one out and still leaves a gasoline line in perfect working order.

Attempts were made to use a single inlet and exhaust manifold for all eight cylinders, but difficulties were encountered as a result of the great overlapping of the valve periods. For this reason two manifolds are arranged for both the inlet and exhaust, as if for two independent fours. The dual intake manifold is so designed that each passage from the carburetor to a cylinder has the same resistance to gas flow as every other passage. The intake passage is provided with a new form of hotspot. A blind chamber is provided into which the hot gases can enter but from which there is no outlet. The theory advanced for this is that, inasmuch as hot gases will readily enter from below a compartment filled with cold air, heat will accumulate in the chamber at first rapidly and then more slowly, until a state of equilibrium is attained. The gas then imprisoned tends to keep out additional gas. Thus when the engine is started cold the intake passages are rapidly heated to the desired degree, and thereafter heat is absorbed much more slowly.

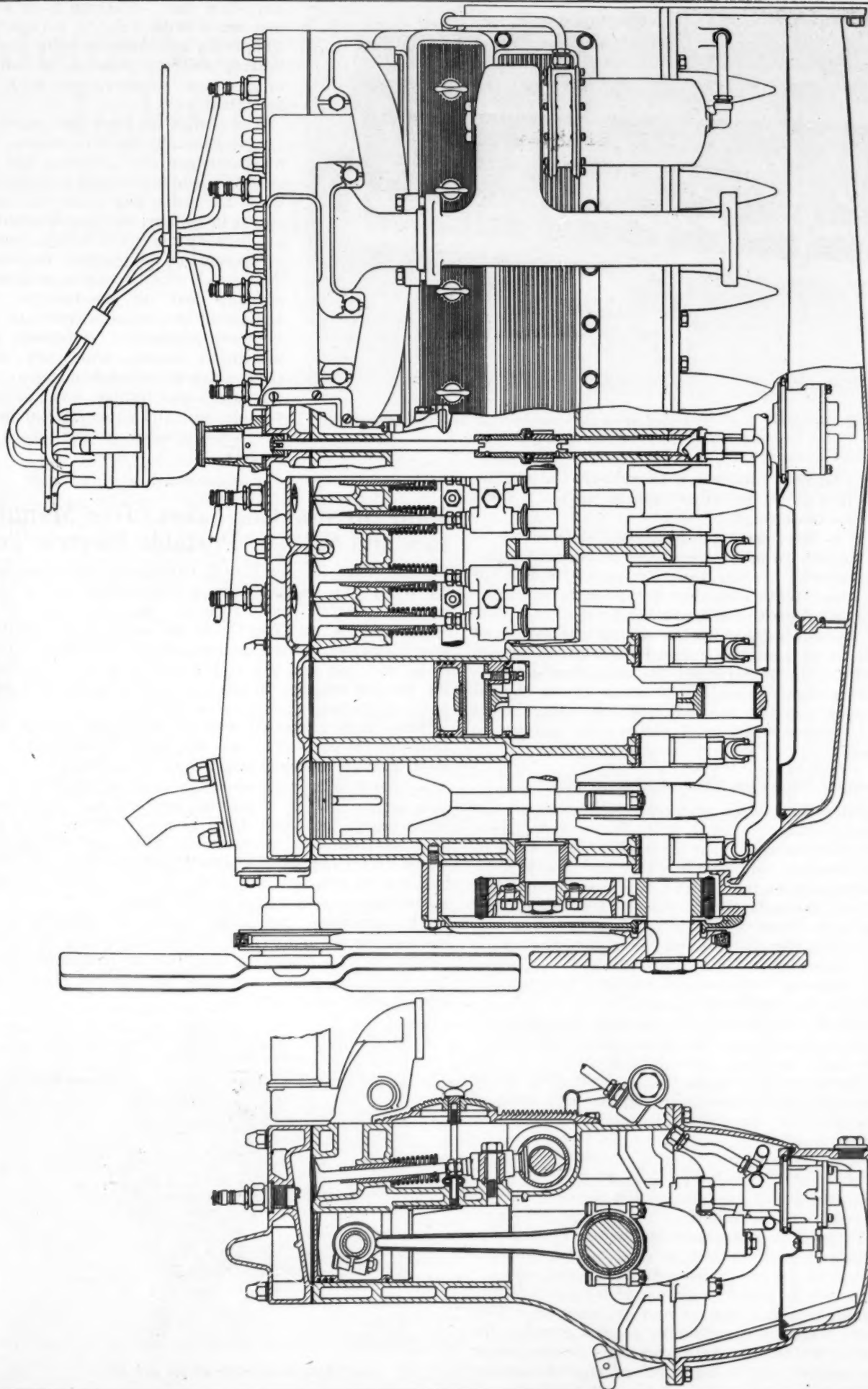
Really Exhausts as Two Fours

From the independent manifolds for the inner and outer fours the gases pass through two exhaust pipes to a dual muffler in a single housing, so that the eight really exhausts as two fours.

Ignition is by a Delco system that has been specially designed for this engine. There are dual contact points on the rotor of the breaker, as well as a dual condenser and a dual coil, so that it is not necessary to limit the duration of contact for each cylinder. The electric starting and lighting system is the American Bosch, with a U. S. L. storage battery of 166 ampere-hours capacity.

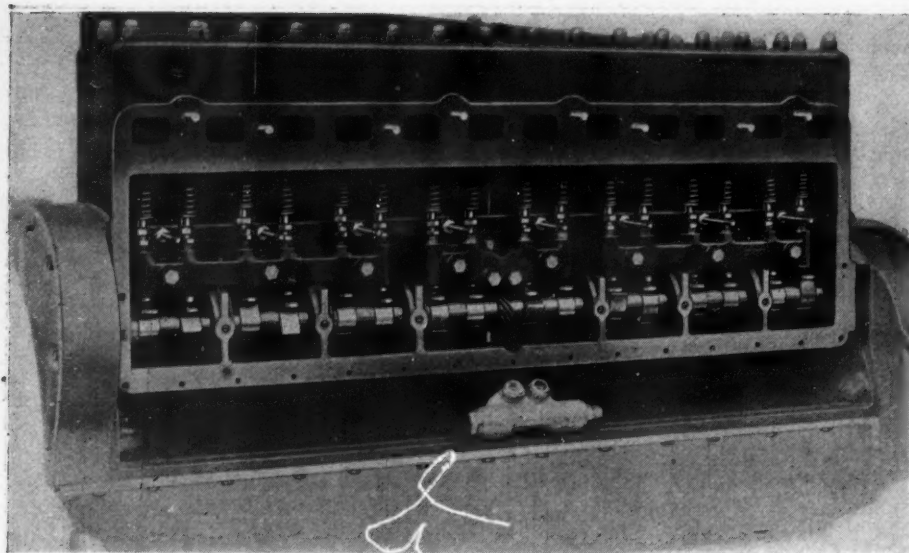
Like the six, the Vertical Eight is equipped with the Skinner oil rectifying system which operates on the distillation principle. Excess oil is drawn off the cylinder walls by the vacuum in the inlet manifold and is passed through an exhaust-heated rectifier in which the fuel component is distilled off and returned to the intake manifold, while the purified oil is returned to the crankcase. It is claimed that with this device the crankcase oil need not be changed oftener than once every 2500 miles.

The clutch and gearset are combined with the engine in a unit powerplant with three-point suspension. A slight departure is made from the practice followed on the six with respect to the method of supporting the front end. Instead of on an annular bearing, the front end of the new eight rests on a small flat surface at the center of the forged cross member, the ends of which are secured to the frame side members just behind the radiator. Between the supporting surface and the engine a thick leather washer is interposed which



Cutaway view of the Vertical Eight from the side

Cross cut section of the engine viewed from the end



Engine with the cover plate removed showing camshaft in separate compartment and blocks of tappet guides

affords the flexibility necessary to relieve the engine of road strain and at the same time furnishes a solid support for the powerplant.

The clutch is the same type multiple disk-in-oil as in the six but heavier to take care of the increased torque. The gearset also is heavier than in the six and it incorporates a new feature in that provision is made for the return of oil from the bell housing to the crankcase. The clutch release is oiled by the engine pressure feed system, and to prevent the accumulation of an excess of oil in the clutch compartment, the rear flywheel, acting as a centrifugal pump, is caused to throw the oil into the upper part of the bell housing, where it is caught in a groove, whence it returns by gravity to the crankcase.

Heavier Propeller Shaft and Rear Axle

The propeller shaft, rear axle and other parts of the drive are practically identical with the corresponding parts of the six but are made heavier to take care of the increased weight and torque. One new feature, recently incorporated in the six and now also used in the Vertical Eight, consists in a method of automatically lubricating both front and rear pinion bearings. A patented construction is employed whereby the oil is scraped off the sides of the ring gear and discharged at the front bearing, whence it flows back through the rear bearing to the differential case.

The four-wheel brakes are of the same mechanically operated, expanding type as in the six. Gear type differential brake equalizers are also incorporated. An improvement has been made in the brake operating mechanism by providing outboard bearings at both ends of the front brake shaft, in addition to the bearings in the bell housing.

Spring Suspension Same Type as the Six

The same type of spring suspension as used on the six is employed on the eight. The springs are semi-elliptic and the frame rests between them. The springs are longer, being 59 in. center to center, and equipped with Hartford shock absorbers both front and rear.

The frame is 8 in. deep. A bronze casting constitutes both the radiator tank bottom and its support. This construction, makes it possible to readily remove the radiator, after which the chain, camshaft or any major part of the engine can be taken off without disturbing

any other part. Steering is by worm and wheel with $11\frac{1}{2}$ to 1 reduction. This ratio, in connection with the ball bearing steering knuckles, is claimed to give easy steering, even with balloon tires.

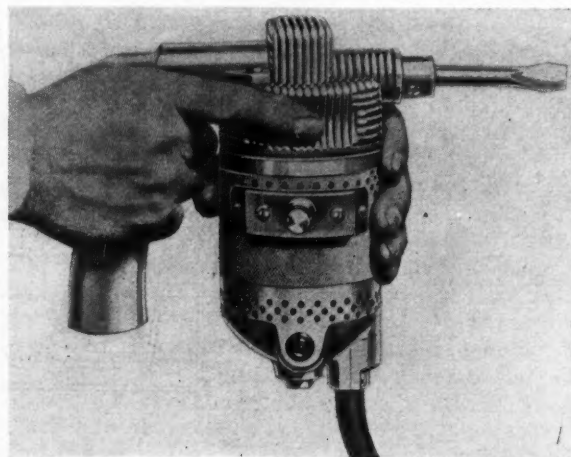
The bodies are new and were designed especially for this chassis. The five-passenger sport phaeton has low, long lines and is trimmed with leather, while the sedan and coupe are upholstered in moh. ir. Sloping windshields are fitted to the closed models, and the equipment of all models includes a double lock which operates on both the steering gear and the ignition. The equipment also includes front and rear bumpers, motometer, motometer lock, motometer wings, drum tire cover, clock, automatic windshield wiper, vanity case, cigar lighter, gasoline gage, trouble lamp and automatic car heater are also included in the closed car models.

John Steptoe Co. Takes Over Manufacture and Sales of Portable Electric Tools

THE John Steptoe Co. of Cincinnati has recently acquired the manufacturing and selling rights to the portable electric tools formerly manufactured by the Automatic Electric Tool Co. of the same place. While the line comprises electric screw drivers, lag screw drivers, drills and bolt and nut tighteners, it is the intention of the Steptoe company to concentrate for the present on the screw driver and the lag screw driver.

These tools are fitted with an automatic switch which shuts off the current in case the motor is overloaded. The electric screw driver is said to have been found very handy in automobile body plants, on account of its light weight and portability. It is claimed that one man with one of these power tools will drive as many screws in a given time as from two to four men with hand braces. The screw driver is provided with a pistol grip handle and bit and weighs complete only 5 lb. It can be used for taking out screws as well as for driving them.

The automatic lag screw driver is specially recommended for the millwright, for use in putting up counter-shafts and for fastening machines to platforms. It has the same automatic switch as the electric screw driver and weighs complete 30 lb.



Steptoe electric screw driver

Motor Vehicle Development Helps All Industries, Business Leaders Say

Opinion is not unanimous but majority sees automobile as big factor in promoting prosperity, Packard survey shows.
Car buying contributes to economic progress.

By Alvan Macauley
President, Packard Motor Car Co.

DEVELOPMENT of the automobile has been a direct benefit to general business. It has made for an increased earning power for the country as a whole. It has been a stabilizing influence when such was needed and it has stimulated all lines of business as well as the people themselves.

These were the inevitable conclusions reached from analysis of answers to a questionnaire sent out recently by the Packard Motor Car Co. to leading men in various industries. The queries were prompted by the fact that I found through contact with bankers generally that many of their borrowing customers who are not prosperous have been inclined to blame the automobile for their lack of prosperity.

That these merchants have not interpreted correctly their business difficulties is borne out strongly by the replies received from men conducting activities having no direct contact with the automobile industry. Many of them, in fact, are in lines which might be considered as competitive.

Railroad men, long considered antagonistic to the automobile interests, expressed a nearly unanimous opinion that the automobile has rendered a material benefit to their business. The following reply is representative for this group:

"I think it unquestionable that the popularity of the automobile and its use both for pleasure and business has tended to create a volume of traffic which probably has not decreased the movement of other business, and has been a source of great revenue to the railroads in general."

Men associated with the clothing industry and those businesses whose prosperity depends largely on the farming element of the country were the only ones as a class who expressed the belief that the automobile was responsible for any unfavorable effect, but even here there was a wide divergence of opinion.

There is no doubt that the tremendous expenditure for automobiles is an economic phenomenon of such magnitude that it would seem impossible for other industries not to be affected. But I find no available evidence to prove that they have and we may consider the idea largely pre-conceived. The mistake is often made of holding a pre-conceived idea as an explanation for economic conditions in the face of investigation and facts proving the contrary.

For example, a merchant in a small town experiences a slackened demand for goods. He seeks an explanation based on the evidence which he can accumulate within the narrow confines of his business. Perforce the explanation may be simple. He sees isolated cases of customers overreaching themselves to become the owners of motor cars and he knows that their buying power in many cases is limited.

When the jobber salesman or factory representative calls on him he has an answer to the question, "Why aren't the goods moving faster?" This explanation of unsatisfactory merchandising conditions is borne back to the factory and sales headquarters, to the men who are responsible for directing the conduct of business nationally.

Simple explanations soon become popular among retailers and before many months have passed an unsound conclusion has achieved a large following. I find a more nearly correct idea expressed by the president of a large concern manufacturing men's wearing apparel. He says: "Certainly the motor car has brought thousands

The charge often is levelled at the automobile that it is an extravagance as well as a breeder of extravagance. A few decades ago the same statement was made in connection with the bath tub.

of people from the outlying districts into the urban centers to do business daily, winter or summer, who, before the popularity of the automobile, saw the town or city very seldom. This added buying power must, we believe, have helped all types of business. The individual retailer finds it difficult to understand that this is so, for his local competition has increased in proportion to the added number of people coming into his town to buy, and, consequently, he can see only the fact that the consumer has so many demands upon his dollar today for installments on his car and operating expenses that there is less of it to spend on clothing."

Industrial leaders are forced to keep their ears to the ground, but they do not let themselves be swayed by unsound explanations no matter how loud the chorus. They see the play of economic forces as a broad picture and discount the isolated case. They are not interested in alibis which are impotent to improve unsatisfactory business conditions and which delay the taking of drastic remedial action by reason of concealing the real matters at fault. This is well illustrated by the reply from the president of a concern manufacturing a product which is sold in competition with the automobile. Part of what he said follows:

Our salesmen frequently report loss of sales due to the contemplated purchase or the maintenance of an automobile. We are unable to ascertain whether this loss is really as great as they say it is for salesmen have a habit of shifting the blame to anything that is popular. On the other hand, this is balanced by the many great automobile companies employing thousands and thousands of men who may through their prosperity become purchasers of our product."

Another expression in a similar strain comes from the president of a concern making men's clothing. "Our salesmen from time to time, especially when sales are falling below normal, are prone to attribute the falling off to the growth of the automobile industry. This may be a habit with them and I doubt if they have any more information on the subject than I have myself."

Automobile Is Not an Extravagance

The charge often is leveled at the automobile that it is an extravagance as well as a breeder of extravagance. A few decades ago the same statement was made in connection with the bath tub and the telephone. In this connection the comments of a producer of raw materials is of interest. He says:

"I question whether the present day purchaser of a motor car spends more in proportion to his income than the man who bought a horse and carriage twenty years ago. It is also a fact that a far greater percentage of the population have relatively larger incomes than formerly and have many more hours for recreation."

There is no doubt that automobiles are purchased by people who cannot afford to become owners. The same situation is found in the buying of all commodities. This fact does not make the motor car any less essential in our national life and in the aggregate the cases are too few to have any appreciable effect on general prosperity. The idea is summed up well by the president of a large Eastern manufacturing company, who says:

"While I believe that many people spend more for automobiles than they should, this is individual extrava-

"One of the most potent forces for good in this country today is the opportunity the automobile has given to the people to get better acquainted—to get the other fellows viewpoint and permit him to get yours—to help him in his problems and point out his further possibilities—and that through this opportunity there will be a better understanding and a surer development of our country's and the world's resources than through any other medium known."

gance and extravagance existed long before automobiles were thought of. There have always been extravagant people and there always will be."

That the automobile is responsible for extravagance is most often charged by men associated with industries catering to the agricultural interests. The following statement is made by a member of this group:

"There is no doubt about the fact that automobiles are today one of the largest factors in raising or swelling the family and business budget. The direct expense of the automobile plus the thousand and one other expenses that go along with the use of an automobile, is today causing many people to fail to pay their obligations and employ their funds along industrial lines or spend

their money in ways that would tend to build up industry other than the automobile industry."

If it were true that the heavy buying of cars was absorbing an inordinate share of the purchaser's dollar we might expect to find a diminution of savings and outlay along the lines of insurance, investing and the like. But on the contrary, accurate records show that savings bank deposits, investment, life insurance and building and loan assets have all increased steadily throughout the past decade and at an accelerated pace in the last three years. The phenomenal growth of life insurance is particularly noticeable. In the light of these increases I find it difficult to establish the fact that the buying public in general has been forced to scrimp on other necessities of life.

Time payment sales have increased enormously during the past few years and a few industrial leaders look askance at this development, believing that it tends to encourage people of small means to indulge themselves unwisely. In the words of a railroad president: "The chances of unwise investment have been increased by the very wonderful credit selling system in connection with the automobile business, it being possible under present conditions for any man who has recognized earning power to buy an automobile or an automobile truck with a small down payment, in fact, there is nothing which represents so much money which can be so easily acquired and to an extent this is true, the danger of unwise purchases is increased."

Undoubtedly there are cases in which people are led to overreach themselves, but that is not general. The fact that at least 95 per cent of payments are made promptly and that the ultimate losses are negligible indicates that the financial strain of ownership is not too great. Many people of substantial means prefer to buy on time rather than dispose of certain investments and in general the time payment plan makes automobile purchase a "pay-as-you-ride" expenditure and reduces the capital investment.

Financing Sales Is in Its Infancy

Financing of automobile sales is in its infancy. Some mistakes are bound to be made during periods of development and the financing concerns have not escaped, but there are few business operations which can show such a splendid record, and automotive financing has proved to be one of the soundest of retail financing operations.

Income tax returns are sometimes cited to prove that the country is facing disaster because people of small means are indulging in motor cars. It is reasoned that because national registration of motor cars is far in excess of the number of persons filing returns on incomes of more than \$2,000, per se automobiles are bought and operated by large numbers of people who should be spending their money for other purposes.

This is far from true and cannot be used as a proof that money is being diverted from other industries, for there is a recognized understating of incomes by all classes and in addition relatively few tax returns are filed by farmers who constitute approximately one-third of the automobile owning population. Furthermore, the man with an income of \$1,500 may be far better able to afford an automobile than the man with an income of \$3,000. It depends upon where and how he lives, among other things. The farmer and the small town resident who owns his own home may be far better off than the city man who must meet higher fixed charges in the form of garage rent and insurance.

It is sometimes overlooked that persons having small incomes are heavy buyers of used cars and consequently

they constitute an important market, for they absorb cars which must be resold before new cars can be purchased by persons of greater means. Economists have given up trying to estimate automobile buying power by means of income tax returns.

What income tax returns do reveal is a growing national buying power and industrial leaders are inclined to credit the automobile industry with a large share in bringing about this condition. They realize that this benefit is hard to measure accurately, but they are nearly unanimous in saying that it greatly offsets any harmful effect to specific industries. In the words of one manufacturing executive, they realize "that almost every business has been assisted rather than injured by the development of the motor car, even though one can find many cases where the individual would be better off without than with a machine on account of the expense involved."

The contribution of the automobile is not limited to the direct benefits of furnishing employment and increasing national earning power. There also are indirect contributions to the prosperity and welfare of the country and replies to the questionnaire indicate that the

realization of these indirect contributions is widespread. The president of a cement company says: "The indirect effect of quicker transportation to market centers and places of employment, education and recreation for our people has caused a higher standard of living and a demand for better things, which in turn should help all legitimate business."

The automobile is a great democratizing influence and in this respect it is doing more to make people happy and contented and to eliminate class antagonism, which hinders national development, than any other instrument. This idea is ably expressed by the president of a nationally known metal refining company, who made the following statement:

"I believe that one of the most potent forces for good in this country today is the opportunity the automobile has given to the people to become better acquainted—to get the other fellow's viewpoint and permit him to get yours—to help him in his problems and point out his further possibilities—and that through this opportunity there will be a better understanding and a surer development of our country's and the world's resources than through any other medium now known."

Reed-Prentice Announce New Four-Speed Production Lathe

A FOUR-SPEED production lathe said to be well adapted for straight, taper and form turning, straight and bevel facing, recessing and straight and form boring operations in automotive production is being announced by the Reed-Prentice Company of Worcester, Mass. The design is unusually rugged and is claimed to permit extra heavy cuts to be taken with both front and rear tools at a time, as required in the machining of such parts as steering knuckles, camshafts, armature shafts, cluster gears, etc.

The headstock is of box construction and is arranged with four spindle speeds, which are obtained through sliding gears positioned through crank handles conveniently located on the front of the headstock. The drive is through a disk clutch and brake located at the rear of the head and operated by a hand lever.

All of the headstock gears are of hardened steel, and the driving gears to the spindle are of the herringbone type, providing for smooth power transmission to the spindle. All of the gear shafts in the headstock, with the exception of the spindle, run in ball bearings, while the spindle journals are hardened and ground and run in bronze bearings.

The headstock can be furnished with either belt or motor drive. The illustration shows it with motor drive through herringbone gears, with all gears running on ball bearings. The motors used range from 5 to 20 hp., depending upon the class of work.

The cam tailstock provides for quick withdrawal of the tail center, as well as a fine adjustment of the center in the work. This provides for quick loading, and a handclamp locks the tail spindle when the machine is in operation.

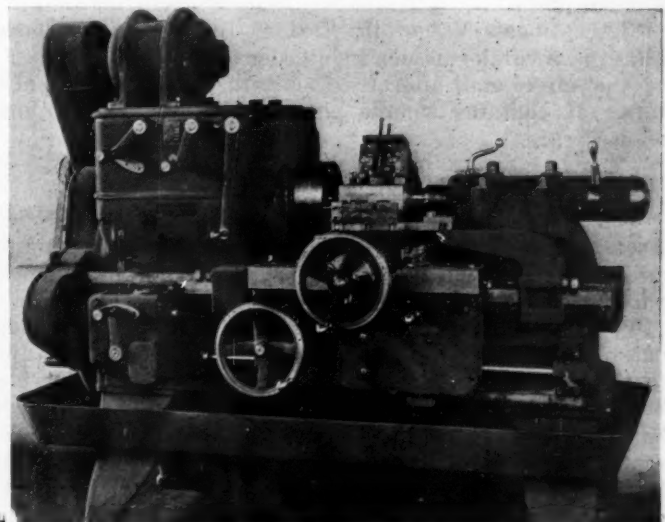
The carriage bridge is supported on a right angle bearing inside of the bed, directly under the front tool holder. The apron is arranged with independent power longitudinal and cross feeds, either of which may be engaged separately. Both the longitudinal and cross feeds are automatically operated and tripped in both directions, the direction of the feed being determined by the position of the hand lever projecting from the front of the apron. The change from longitudinal to

cross feed, and vice versa, is effected by a pull gear controlled from a handle protruding from the front of the apron.

The feed box regularly furnished gives four feeds, and by compounding the standard gears constituting the end works, three additional feeds may be obtained. The changing of the feed in the gear box is accomplished through sliding hardened steel gears operated by a crank handle at the front of the box.

The facing and chamfering operations are obtained through the use of a Reed-Prentice patented back arm attachment provided with sensitive worm adjustment for the tools in relation to the work. This attachment has a long angular support bearing on the lower part of the bed.

The entire headstock is lubricated by splash, an oil gage showing the level of the oil at all times. All apron bearings are oiled from pipe connections to an oiler at the top of the carriage, while the feed box bearings are lubricated from pipe connections to the top of the box. Other bearings are provided with oil cups.



Reed-Prentice No. 2 four-speed production lathe

Dodge Bros. Used Car Plan Educates Dealers as Well as Public

Sound psychology involved in fresh presentation of constructive methods of handling trade-ins. Factory production so adjusted as to provide profits for dealers.

A WEALTH of interesting ideas is developed from a study of the six pieces of literature recently put out by Dodge Bros. in their used car campaign. While the basic principles brought together in this effort to help dealers solve their used car problem have been incorporated in the Dodge policy for some time past, the gathering of them into a special campaign makes it possible to evaluate them and to pick out certain fundamentals likely to be of use to other manufacturers in their dealer education work.

The campaign literature itself consists of six pieces. One piece gives "Information on Used Car Values for Dodge Bros. Dealers." This is a six-page booklet which outlines concisely the fundamentals of the used car question. It explains the wrong principles often employed in making trade-in allowances, tells the dealer about the real value of a used car, discusses fictitious values, and ends up by describing the business advantages to be gained from honest merchandising methods.

"Used Car Common Sense," another piece in the campaign, is a 6½ x 4½ in. facsimile of a large poster for showroom display. This poster explains in detail for the benefit of the customer the basis on which the dealer will appraise a used car to be taken in trade. It is reproduced in an accompanying illustration.

"Our Used Car Policy" is a pocket-sized slip of paper attached to the small facsimile of the poster. It explains to the dealer salesman how he can use the poster on "Used Car Common Sense" and urges him to cooperate with the appraiser to the fullest extent "to convince the customer that when we take in his used car in part payment on a new Dodge Bros. car we are entitled to a reasonable profit."

"Exceptional Value in Dodge Bros. Reconditioned Cars" is a catalog folder printed on coated paper similar to the direct-mail literature sent to prospects for new cars. It contains sample photographs and descriptions of used cars.

Offers Practical Information

The piece entitled "Used Car Advertising for Dodge Bros. Dealers" is a 60-page booklet containing sample advertisements which dealers may insert in local newspapers concerning used cars.

Two outstanding features run through the entire campaign. First, the information given, both to dealers and to the public, is practical and specific. No attempt has been made to sidestep obvious questions nor to gloss over hard facts by high sounding words. The material is presented in a frank, straightforward manner that in itself tends to build confidence in the truth of the arguments given. The effect of this sort of presentation has not always been recognized sufficiently in automotive publicity

and in dealer literature. Inspiration too often has been asked to do a task which should have been delegated to critical analysis and frank speaking.

That part of the campaign directed to the public is particularly interesting since it seems likely to perform a double task. Its psychological effect probably will be such that it will accomplish its avowed purpose of giving the public a better understanding of used car values and in addition will help to educate the dealer himself. Suppose a dealer uses in his local newspaper the following advertisement suggested in this campaign:

Copy Puts Dealer on Record.

"We would not jeopardize the reputation for honest value which attaches to ourselves as dealers in Dodge Bros. motor cars by allowing you to buy here a used Dodge Bros. car which is not, in every way, an honest value."

When a dealer signs his name to an advertisement of this kind he is going to find it very difficult to stay in business long unless in actual practice he lives up to his published statements. He has put himself on record and his customers will not be long in calling his attention quite forcefully to any deviation from his announced creed. Consequently, the influence of the campaign which the dealer uses to sell the public will be toward educating, indirectly, the dealer himself in the practical value of honest service.

One of the best ways to sell a man on any idea is to get him to sell it to someone else. There is a good bit of psychological truth in the old statement about the member of the Ananias Club who told the same story so often that finally he came to believe it himself. In this case, the principles enunciated are entirely sound, but often it is difficult to get dealers to put them into practice. Consequently the psychological basis of this Dodge Bros. campaign seems to be particularly good.

The courage and far-sightedness of the factory behind a plan of this kind is another feature which is developed by an analysis of the idea. If a dealer is to be encouraged and expected to make trade-in allowances and to handle used cars on the plan outlined in the accompanying poster, the factory urging him to conduct his business in this way must be prepared to back him up to the fullest extent. Competition for new car sales, of course, has been one of the chief reasons for excessive trade-in allowances. The dealer who takes the stand that he will buy used cars only on a profit making basis is almost certain to lose a few customers; at least those who say, "Well, I might as well profit from dealers' foolishness just as long as they can stay in business. When I have to take only a fair allowance for my old car, then I will do so."

Consequently the factory urging a dealer to operate on a profit making basis must be ready to refrain from

forcing on him any more cars than he reasonably can be expected to sell. This policy has been followed out by Dodge Bros. for many years. It has been successful.

The general character and tone of this Dodge Bros. used car campaign is such as to raise materially the level of used car merchandising. All of the literature, the arguments, the copy, and the layouts suggest dignity and high quality. The bargain sale idea has been excluded completely. Emphasis throughout has been placed on value rather than price.

A large part of the copy suggested for used car advertising will be of value to all dealers in the community in which it appears, whether they handle Dodge Bros. cars or not. Most of it tends to establish the used car as an article of merit and honest value, and to impress on the public the possibility of getting good service from such models. Sample advertisements are reproduced here.

Question is certain to arise as to the relationship between a plan such as the one advocated by Dodge Bros. and any one of the various local cooperative used car plans which now are in operation in a number of towns. Most factories are opposed to their dealers participating in local cooperative used car plans; it is understood that

this is the attitude assumed also by Dodge Bros. The fact remains, nevertheless, that many of these plans are functioning at the present time and that, in some cases, they are bringing material benefits to the dealers participating. It would seem that there need be no fundamental obstruction to dealers operating on a constructive basis such as the one outlined by Dodge Bros. and at the same time lending their efforts to bettering the general situation in their own communities through cooperative action.

The Dodge Bros. plan is worth study by other car manufacturers, embodying as it does a number of practical, constructive features which should prove valuable to the industry as a whole. The ideas about handling used cars propounded in the campaign are not new to students of the problem, but they are presented in such a way as to give them a fresh significance. The basis of the Dodge Bros. campaign is outlined in the booklet entitled "Information on Used Car Values for Dealers," the text of which is as follows:

"During the past few years the methods employed in selling new cars have become so confounded with the handling of used cars that definite knowledge on used car

No. 108

GOOD VALUES IN USED CARS

The good will we enjoy as dealers in Dodge Brothers Motor Cars is worth too much to be endangered by the sale of a single Used Car that is not good value.

Our first thought in this department, as in every other, is to make one more friend for this business.

No. 109

GOOD VALUES IN USED CARS

In selling you a used car, we aim to make you a permanent business friend.

With a policy which thus looks to the future, you may be sure that we are not going to let you purchase a used car that will be anything other than very good value.

No. 110

GOOD VALUES IN USED CARS

No Used Car will ever be offered in this department which is not worth every dollar asked for it.

We consider our responsibility in this respect just as great as in the sale of Dodge Brothers Motor Cars.

THOMAS J. DOYLE
722 Woodward Glendale 7117

No. 111

DODGE BROTHERS USED CARS

Often you hear men say that if they cared to invest a little money in this or that, they could get thousands of more miles out of their cars. But they don't bother. They trade in on a new car. And then we make the repairs which they should have made. And the cars are good for thousands of more miles, just as they said.

Remember: A used car is only as good as the firm with which you deal

W. H. Burdette

BURDAN MOTOR COMPANY

No. 112

DODGE BROTHERS USED CARS

It has been said that the only way to make real money in the Used Car business is to sell them "as is." That may be a good way to make money—for a short time—but it is not a good way to make friends. We figure that if we get the friends, the profit will take care of itself.

Remember: A used car is only as good as the firm with which you deal

BURDAN MOTOR COMPANY

No. 113

GOOD VALUES IN USED CARS

The good will we enjoy as dealers in Dodge Brothers Motor Cars is worth too much to be endangered by the sale of a single Used Car that is not good value.

Our first thought in this department, as in every other, is to make one more friend for this business.

1. Sample advertisements suggested for dealer use by Dodge Bros. in their booklet "Used Car Advertising," which is a part of their used-car campaign. The copy tends to promote confidence in used cars in general and attempts to merchandise used cars on a dignified, profit-making basis. Note the emphasis on value and the absence of the bargain-sale idea. The copy for the campaign was selected from advertisements already used successfully by dealers

USED CAR COMMON SENSE

NO Used Car Buyer will be Asked to Pay More for any Used Car than it is Worth. No New Car Buyer will be Offered Less on Appraisal for his Used Car than it is Worth.

The actual MARKET VALUE of a USED CAR depends entirely on its make, appearance, mechanical condition, and the demand based upon the reputation of that make of car.

ALL USED CARS will be purchased by us for CASH or taken in as part payment on new cars only as outlined in the following example:

- A. We will assume that the sales value of a certain USED CAR in marketable condition is \$600.00
- B. From this figure we shall deduct 15% as follows: 5% for selling commission; and 5% for overhead, including rent, light, insurance, etc.; and 5% for advertising, guarantee on USED CAR to buyer, and interest on money invested . . . \$90.00
- C. Experience has shown that it costs about \$84.00 to recondition thoroughly a car of this model in this condition. This amount is determined for each car by a careful appraisal made by a technical expert who knows the cost of the work required. This may include overhauling the engine or other units, replacing worn bushings in the chassis, repainting the body, dressing the top, replacing tires, or any other work necessary in order that we may indorse it as a RELIABLE USED CAR \$84.00 \$174.00
- D. It is quite evident that the actual value of a USED CAR or the allowance price must be obtained by deducting the sum of B plus C from A, which is \$426.00

Our method of figuring USED CAR values is based on long experience in buying and selling used cars, and is eminently fair to everyone concerned. The owner receives a fair price, and the USED CAR BUYER receives a thoroughly reconditioned car, which we can endorse as sound value.

Any owner who wishes to take the time and incur the expense of advertising his car, to make five to ten demonstrations, perhaps remaining at home evenings to do this, to take notes for 70% of the price, can, after spending the money necessary to put the car into the condition demanded by the buying public, sell his car at the same price we ask.

REMEMBER, it is easy to get a higher allowance for a USED CAR than it is worth by trading it in on a new car which carries an inflated selling price.

Dodge Brothers Motor Car List Prices are not inflated to cover used car allowances, but do reflect only true value.

We cordially solicit your business on the basis outlined above. By adhering to these policies we protect our good name and assure you honest treatment and continued good service.

2. One of the units in the Dodge Bros. used-car campaign designed to educate the public on used-car values. This is designed as a poster to be displayed in dealer salesrooms

values has been obscured. In some cases selling even approaches misrepresentation, with the result that many buyers have a complete misunderstanding of the fundamental principles of automobile merchandising.

"In order to buy intelligently it is obvious that there should be a very clear idea of these fundamentals. It is therefore imperative that dealers begin at once to acquaint the public with the truth about the manufacture, sale and resale of automobiles. All information which will contribute to the intelligent purchase of cars will, in the long run, benefit manufacturers who build and market automobiles honestly and at a fair margin of profit.

"One of the most unfortunate and most surprising things about the automobile business today is the tendency of new car buyers to shop around with the idea of getting the highest possible allowance for their used cars. It would seem that the customer who is about to invest approximately \$1,000 in a new automobile would consider of prime importance the quality of the product which he is buying and its ability to render satisfactory, economical service for a number of years. The investment is of sufficient importance to hold his undivided attention to the matter of getting the greatest value for the money.

"However, to the average owner, the item of depreciation in his motor car is by far the most distasteful of any in his records. Depreciation always comes to his attention in a lump sum, whereas operating costs are dis-

tributed over the period of ownership, and seldom is a record kept of the total. For this reason a high used car allowance often appeals because it makes the rate of depreciation look smaller.

"The question of value to be received in the new car should be the only issue to be decided. One would naturally expect to find customers on guard against the attempts of some dealers to draw attention from the main issue by an extra allowance for the used car. Yet a great many buyers are still misled by such schemes.

"The greater the desire that can be created to own a Dodge Brothers car the easier it will be to carry on the appraisal of the used car. Therefore the salesman should first concentrate his effort in creating that desire and explain carefully the elements that constitute the surplus value (for surplus value study the revolving disc which Dodge Brothers provide) in Dodge Brothers product. As the time approaches for discussing the used car and its appraisal, the salesman is in the position to take the offensive. A frank statement to the effect that in all probability there are other dealers in the city who would offer more for the used car gives the prospect the impression—and rightfully so—that Dodge Brothers dealers have a definite used car policy for handling used cars in that they do not propose to bid beyond good business judgment.

"Customers should be made to realize that Dodge Brothers dealers make a close study of the used car market—that they have a record of the selling values of all makes and models of used cars—that it is an important part of their business to keep posted, and that there is no guesswork about the appraisal made on used cars.

"This should be explained, and if there is any question concerning the fairness of the appraisal it may be quickly and easily verified by the advertisements of the same make and type of car offered for sale in the want ad section of the newspapers.

"Explain to the customer that Dodge Brothers dealers purchase used cars for cash, whether they are Dodge Brothers cars or any other standard make. No dealer should offer more for a used car as a so-called "trade-in" allowance than he is able and willing to pay in cash.

Only Actual Value Allowed

"The price offered by a Dodge Brothers dealer is the actual value of the car—just what it will bring in the open market—less proper deductions for reconditioning, selling and overhead expenses. Any allowance made by competing dealers in excess of this price is apt to be a false value entailing a loss in resale. Such excess price represents either a wide margin included in the price of the new car to absorb used car losses, or of bad business judgment on the part of the competing dealer.

"The important question to the customer is—Who really pays the excess allowance? Suppose the customer brings his car to a Dodge Brothers dealer, who offers him \$200. He then takes it to another dealer, who offers him \$300.

"The obvious answer, of course, is that his margin of profit on the new car is, therefore, based not on actual value but on actual value plus a liberal allowance.

"So the customer pays the excess allowance.

"Through volume production Dodge Brothers are able to manufacture a high quality car at a low cost. They prefer to keep the price list low—charging only a reasonable manufacturer's and dealer's profit to each car.

"Customers should be told frankly that the margin of profit in a Dodge Brothers car does not provide for absorbing any used car losses. There is only one price for a Dodge Brothers car, and all purchasers benefit alike, whether they turn in an old car in trade or pay the full amount in cash."

Toledo Advertising Conference Brings Out Merchandising Needs

N. A. C. C. discussion included laboratory methods of studying and testing results of current copy, opportunities that exist in the farm market for automobiles, the use of keys on each piece of advertising and some means of cutting the cost of distribution.

LABORATORY methods of study are needed to determine the effectiveness and value of advertising copy now running.

The farm market for automobiles has not been cultivated to the fullest possible extent, despite the tremendous number of vehicles already sold in these areas.

New merchandising ideas are needed to stem the tide of rising merchandising costs.

These were the chief ideas developed at the meeting of National Automobile Chamber of Commerce advertising managers held in Toledo, June 19 and 20. Discussion led also to rate questions of a technical nature.

The first session of the conference was held at the Toledo Country Club on Thursday morning. The delegates were welcomed by Grove Patterson, executive editor of the *Toledo Blade*. Edward S. Jordan presided.

"Every manufacturer today is facing the problem of increasing cost of distribution," declared G. Lynn Sumner, vice-president of the Association of National Advertisers, and advertising counsel for the International Correspondence Schools, Scranton, speaking on "Keys that Unlock Advertising Secrets."

"As this condition of increasing cost of distribution goes on," he continued, "more and more are the advertising men taking their work into the laboratory for study to devise scientific methods of using their advertising to get maximum returns on investment."

Sumner explained the system of keys that is used in his copy by which the effectiveness of every piece of advertising is accurately cataloged and he presented some facts brought out in analyses made. Relative size of advertisements presents a problem, while other questions of importance are the effect of abnormally sized magazines or papers, and the quality of copy.

Half-Page Advertisements

"We have found in our studies that a half-page advertisement in a magazine will command about 71 per cent of the attention of a full-page and cost approximately a fourth as much," he pointed out by way of example. "And we have found that there is a limit to the number of advertisements that a magazine can carry and among which reader attention may be successfully divided. The size of some of the abnormally large magazines must be considered.

"Today advertising copy is a most important thing. Every word and picture in an advertisement, if in the daily newspapers, must compete with the most dramatic events of daily life for the interest of the reader. And in magazines they must even compete with alluring fiction."

In the discussion following the presentation of Mr.

Sumner's talk there was considerable division of opinion about direct-mail advertising and its adaptability to the automotive field. Many dealers feel that it is a good plan to incorporate considerable direct-mail effort in advertising plans, but are hampered through dealer lists not being kept up to date, and not being carefully selected with a view to ultimate results.

One company reported successful results on supplying direct-mail literature to 90 to 250 names per dealer according to the size of the business. Larger campaigns have been found ineffective because salesmen cannot properly follow up the advertising.

Direct Mail Advertising Costs

Another felt that direct mail is wasteful in comparison with the per capita cost of prospects secured through newspaper space.

Still another advertising manager who uses both systems emphasized the different aspects of approach and considers one as complementary to the other.

W. A. James, chairman of the National Automobile Chamber of Commerce sub-committee on rates, made a report of a survey he has been conducting.

"Trading Roosters for Roadsters" was the subject of an analysis of the farm situation by Victor F. Hayden, at the second day's meeting at the Inverness Golf Club. Hayden is secretary of the Agricultural Publishers' Association.

He outlined the farm market as the most logical place for national advertising to make itself felt.

There are 2,000,000 farmers who do not own and drive motor cars and the potentialities of more passenger cars, trucks and tractors being placed on farms makes it almost an unlimited field.

Thirty per cent of automobiles manufactured have been sold to the farmer, and they have done much to accelerate the city market, because the farmer has been sold on the idea of paying taxes for good roads. Good roads have been the most active force in boosting motor car sales.

Fifty-five per cent of the automobile dealers of the country live in towns of 5000 population and under. It is their sales which develop the prestige that comes with wide distribution.

The farmer and the city man, too, do a lot of shopping on the road.

"The farm market for automobiles is rapidly growing at the present time," declared Mr. Hayden, "because the automobile on the farm has become something more than a means to recreation. It is a vital business element of farm life and a strong link in marketing. The story of progress on the farm has been one of power—not

better illustrated than in the automobile, the truck and the tractor.

"Every other farmer today has a motor car and there are 430,000 miles of good roads. He spent \$700,000,000 for automotive products last year.

"Now is the time to cash in on farm possibilities, for the farm market has hit the turn and is going into high. I know of two big corporations that have been studying markets for ten years ahead, and they have now decided to slacken their city efforts and concentrate on the farm. The farm cycle is starting its swing. Building and other industry in the cities have reached their peak and employment in the cities has begun to decline. The economic law of gravity is equalizing farm and city.

"In 1923-24 the farmer's cash income was 154 per cent of what it was in 1913 and the April commodity index of prices the farmer pays for what he buys was 152.

Farm Buying Power Curve

"Farm buying power over a period of years is dependable, too. If you take a curve with 1923 as 100 you will find from 1867 to the present the graph of the farmers' increased buying power is almost a straight line at an angle of about 30 deg.

"Present depressed conditions in cities only emphasizes the turn of favor towards the farmer.

"When you start trading roadsters for roosters and limousines for livestock, you will want to use advertising space and today the farm papers offer almost 100 per cent potential customers among their readers.

"The most logical thing today is to go into the farm market."

Most of the delegates were pretty well sold on the fact that the farm does offer a big opportunity for new business.

Charles Frey of the Charles Daniel Frey, Inc., New York, discussed several technical aspects of agency business showing what becomes of the usual two per cent of gross sales devoted to advertising appropriations.

House organs and movies took up most of the discussion period.

Reason for Fewer House Organs

The reason for fewer house organs today is due to the dealer's lack of interest in them, and because it is difficult to get cooperation and follow-up in the mailing list of such publications. Many manufacturers, too, have difficulty in seeing the direct sales value of the house organ in times when economy is the watchword of the merchandising program.

"Can Motion Pictures Sell Cars and Trucks?" The advertising men answered affirmatively but qualified their opinion by the proviso that they be shown in the sales room. When moving pictures are taken to the public at large the merchandising element has to be subordinated in most cases to a point where sales effectiveness is all but lost.

Each afternoon was devoted to golf under the direction of the Toledo committee, which was made up of C. O. Miniger, president of the Electric Auto-Lite Co., Gordon Mather, president of the Mather Spring Co., Robert Stranahan, president of the Champion Spark Plug Co., and Ward Canaday, president of the United States Advertising Corp.

Among those present at the two-day conference were Thomas O'Brien, Oldsmobile; Charles Oswald, White; B. B. Kimball, Oakland; J. E. Baird, General Motors Trucks; Roy A. Sears, Auburn; W. K. Towers, Paige; W. A. James, Hudson-Essex; Robert F. Wood, Autocar; Frederick Dickinson, Hupmobile; Verne Burnett, General

Motors Corporation; Bruce Millar, General Motors Corporation; Edward S. Jordan, Jordan; R. H. Crooker, Federal; H. W. Walker, Case; John C. Long, secretary, National Automobile Chamber of Commerce; Robert Swiss, Willys-Overland; and F. W. Munro, Hupmobile.

Successful Tests Made with Inverted Liberty Engine

THE Engineering Division of the U. S. Air Service has conducted successful tests with an inverted Liberty engine over the period of a year. A standard DH4 airplane was remodeled for the purpose and a standard Liberty was put through the Dynamometer Laboratory.

"A great deal of flying has been done with the DH equipped with the inverted Liberty and even in cross country work it has been successful. Its longest trial of this kind was made last fall when Lt. F. O. Carroll, pilot and F. W. Heckert, observer, flew it from Dayton to St. Louis for the Pulitzer races.

"In view of the success of this equipment, plans have been made to build four Liberty engines, especially designed for the inverted position and should these prove successful, it is possible that the inverted engine will be adopted as standard for all corps observation and pursuit type airplanes.

"The chief difficulty which confronted the engineers was the lubrication system. To prevent the oil from flowing into the distributor heads and to obtain means for pumping it out of the camshaft housing and returning it to the oil tank was the first problem to be overcome. A gear-type fuel pump, installed to function as an auxiliary oil pump was used to pump the oil out of the camshaft housings. The backflow of oil into the Delco distributor heads was stopped by adaptors fitted between the camshaft housing, the ignition breaker and the distributor housing assembly. Three-fourth-inch holes were drilled through the main bearings webs in order to allow the oil to flow from one end of the crankcase to the other. No changes in pistons were required to take care of the excess oil, which naturally fell to the under side of the pistons. The suction side passages of the scavenging pumps were arranged so that oil thrown off from the connecting rods and main bearings and collecting in the crankcase could be carried to the scavenging pumps. No changes other than these were made in the oil pump assembly.

Flow of Water Reversed

"A few other changes were found necessary. The flow of water through the water jackets was reversed, primarily to facilitate the operation of the water piping installation. According to the tests it would seem that this reversal makes for better operation of the engine, although this fact has not yet been fully proved in flight. No difficulty was found with spark plugs fouling, due to the change in the position of the cylinders. The standard U. S. 52 Zenith carbureters were used in conjunction with inverted manifolds.

"The reason for all this inverting of engines? The greatest advantage, and it is no insignificant one, is the decided reduction of the blind area straight ahead, which is typical of the DH equipped with the Liberty. This improved visibility simplifies the landing problem to a very marked degree and it is of great benefit in maneuvering.

"Another great advantage lies in the possibility of a simplified fuel system. Since the carbureter is hung under the engine, the fuel supply could be by gravity, obviating the necessity for fuel pumps. The accessibility of the engine for working is also greatly improved as the mechanic can accomplish most of it standing on the ground."

Overhead Valve Engines Predominate at Italian Automobile Show

The first automobile show to be held in Turin since long before the war indicates that balloon tires are just coming into use, and that four-wheel brakes are regular or optional equipment on practically all models. Renault the only foreign exhibitor.

FOR the first time since long before the war, Turin, the center of the Italian automobile industry, is holding an automobile show, the exhibition being staged in the ring of halls under the grandstands of the city Stadium.

Foreign firms, although invited, are conspicuous by their absence, the only car not of Italian construction being a Renault. This is doubtless due to the difficulty of selling on the Italian market against high import duties and an unfavorable exchange. Fiat occupied the biggest space in the show, but with the exception of front wheel brakes as an optional equipment on all models did not present any chassis novelties. This Italian firm is building only one car, a high-grade six, with four-wheel brakes and a hydraulic servo mechanism as standard equipment.

On all the others a new front axle with front wheel brakes can be supplied to order. This change does not interfere with the rear wheel brakes, which comprise two sets of shoes, side by side in the ribbed drums. It is understood that front wheel brakes will be a part of the regular equipment of a new 152 inch overhead valve job Fiat will market at the end of this year, and it is also confirmed that the company will bring out a popular light two-seater, of about 45 cubic inches piston displacement, of the same general type as the Citroen and the Renault in France.

Isotta Increases Cylinder Bore

Isotta-Fraschini, specializing on a straight eight, has increased the cylinder bore from 85 to 95 mm., the stroke still remaining at 130 mm., and giving a piston displacement of 445 inches. The American Link Belt has been adopted for front-end drive and, according to the firm's engineers, gears and chains which refused to stand up to high speed work. The new engine develops 120 hp., compared with 94 on the old type, and as 440 pounds has been taken off the chassis weight, the car is considerably livelier in action. Four-wheel brakes are a standard equipment, as on the earlier model, but the front wheel drums have been considerably increased in size. The width between the frame members has been increased, so as to bring them directly over the semi-elliptic springs. The main steering arm has a coil spring mounting on its shaft.

As an indication of the general European tendency, Itala has produced a six cylinder 122 cubic inch job with overhead valves operated by enclosed pushrods and rockers. This engine is rather distinctive in having the water pump and Marelli generator and distributor crosswise at the rear. Cylinders and upper half of crankcase are one casting, which is contrary to general European practice, and the steering gear is bolted to the right hand side of the crankcase. Engine and gearbox are one unit, but in-

stead of the spherical housing of the propeller shaft being received on the rear face of the gearbox, it is connected up to a central cross frame member, with a short open shaft and fabric joint from the sphere to the gearbox. While this is a growing practice, it is generally limited to cars of much bigger size than the Itala. Front wheel brakes are a standard equipment; the rear wheel drums carry two sets of shoes side by side.

Diatto is also out with a 122 inch four cylinder overhead valve engine, but with the use of an overhead camshaft driven by a vertical shaft at the front end. A feature of this design is that the tire pump and the two-blade wood fan are driven off the upper end of the vertical shaft. While Fiat's big production line, which is probably 75 per cent of the total Italian output, is an L-head job, every firm in Italy, Fiat included, is now building overhead valve engines.

Balloon tires have only just come into use in Italy, and apparently only one dimension, 730 by 130, manufactured by both Michelin and Pirelli, is on the market. This is in distinct contrast to France, where 75 per cent of all cars up to 12 hp. (European rating) are being sold with balloon equipment.

The Weymann fabric leather body was shown at the Turin show by the Alessio Company, which is building under license, but the number in use is very limited. The main objection raised by Italian users against this construction appears to be the absence of the highly-polished finish possible on an enamelled body. Probably owing to the heat and the more equitable climate, closed bodies are not used in Italy to anything like the same extent as in other European countries.

TWO of the universities in northern Germany, those of Hamburg and Kiel, are giving special attention to instruction in commercial law and economics. Attached to the University of Hamburg (which is one of the newest institutions of learning in Germany, scarcely more than a decade old) is a world economic archive, and attached to the University of Kiel is an institute for world economics and sea trade. The two institutions mentioned together publish a weekly periodical known as *Wirtschaftsdienst-Weltwirtschaftliche Nachrichten* (Economic Service-World Economic Reports), of which a sample copy has been received. The institute of world-wide economics in Kiel offers a three-year course in the subject indicated by its title. It welcomes foreign students having a sufficient command of the German language, and has issued a "Guide for Students" printed in English, describing the course and containing other information which would be of interest to prospective students.

Motor Vehicles Contributed 19.5 Per Cent of the Highway Income in 1923

Approximately 12.4 cents of every dollar collected for taxes in 1922 were used for highway purposes. The levy on cars in 1923 amounted to almost twice as much as in 1921.

By Henry R. Trumbower*
Economist, U. S. Bureau of Public Roads

THAT there is a marked tendency to collect a larger proportion of highway funds from the owners and users of motor vehicles is noted in analyzing the various sources of these highway funds and comparing them with similar sources in previous years. A survey of highway revenues and expenditures made in 1914 showed that, out of a total highway income of \$240,262,784, the collections from motor vehicles amounted to \$12,382,031, or 5.1 per cent of the total.

In 1921, seven years later, the motor vehicle owners and operators paid \$118,942,706 in motor-vehicle fees and \$3,685,460 in gasoline taxes, a total of \$122,626,166, or 10.6 per cent of the total income for highway purposes. A similar compilation of the payments made by owners and operators of motor vehicles for licenses and permits in 1923 shows a total contribution on their part of \$188,970,992. In the same year the taxes upon the sale of gasoline levied by 35 States amounted to \$36,813,939. The

At the end of the year the total amount of State and local bonds outstanding was \$1,222,312,300, a per capita issue of \$11.50, or slightly more than the total of a single year's income. The interest on this amount and the requisite provision for retirement constitute a current obligation which must be paid in addition to the costs of highway construction and maintenance from the highway revenues.

The Census Bureau reports at the end of 1922 a total indebtedness of \$8,695,906,000 for the country as a whole, including State, county, local and municipal indebtedness. The highway bonds amount to about 14 per cent of this total indebtedness.

Federal Government Aid Included

The income for all rural road purposes includes also payments to the different States by the Federal Government amounting to \$79,333,226 made in accordance with the provisions of the Federal-aid act, a contribution on the part of the Government which amounts to an assessment of approximately 75 cents per capita.

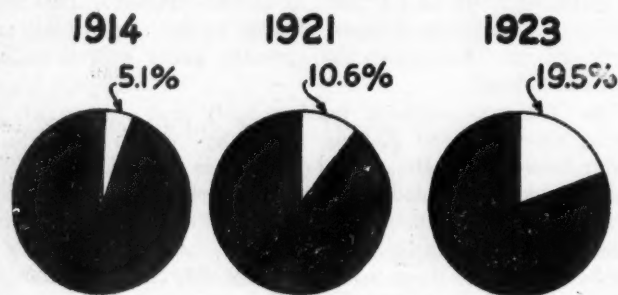
General property taxes contributed \$415,680,010 to the year's total highway income. In addition, \$93,689,221 was derived from other sources, a large part of which amount consisted of appropriations from funds in the respective State treasuries, which in turn had their sources in tax levies. For our present purposes we may consider both of these items as having been payments made by the general public and may therefore be regarded as taxes, although a small portion was derived from other sources which could not be clearly segregated.

The sum of these two items, \$509,369,231, or 44.4 per cent of the total highway income, is regarded in this analysis as the direct contribution of the public toward the cost of highway construction and maintenance and toward the principal and interest payments of the bonds outstanding. The per capita tax burden for highway purposes is, therefore, \$4.83. The total highway income for 1921 is divided and allocated as follows:

Total Highway Income Tax, 1921

Source	Amount	Per Capita
Motor vehicles	\$122,626,166	\$1.17
Bonds	438,109,273	4.15
Federal aid	79,333,226	.75
General property taxes and other sources	509,369,231	4.83
Total	\$1,149,437,896	\$10.90

The Census Bureau in a recent publication reports that in 1922 the revenues of all the States for governmental purposes were \$4,224,541,865. This includes general property taxes, special taxes, poll taxes, licenses, permits



Percentages of total highway income derived from motor vehicles

motor vehicles, accordingly, contributed a total of \$225,784,931.

It follows, therefore, that in 1923 the contribution of the motor vehicle toward the total highway income was about 19.5 per cent.

Between 1921 and 1923, it is observed, the ratio almost doubled. This increase in the contribution made by the motor vehicle is accounted for by the increase in the total number of vehicles registered and in the payment per vehicle, which rose from \$11.70 in 1921 to \$15 per vehicle in 1923.

Another very substantial part of the total highway income was derived from the sale of bonds, both State and local; \$438,109,273, or 38.1 per cent, was obtained in this manner. This amount, which represents a deferred payment of \$4.15 per capita, includes all receipts from the sale of highway bonds during 1921 and all cash from previous bond sales on hand at the beginning of the year.

*Excerpts from an article in *Public Roads*, published by the Department of Agriculture.

and special assessments collected by the States and by all of their political subdivisions. It is not unfair to assume that the public revenues for 1921 were approximately the same as those reported for the subsequent year, and the following comparison is made on that basis.

In deducting from the year's total public revenues \$122,626,166 collected as motor-vehicle license fees and gasoline taxes, there is left \$4,101,915,699 as the amount received from other sources, or a contribution for governmental purposes of \$38.80 per capita. Of this total amount, exclusive of motor-vehicle revenues, \$509,369,231 was collected from the public for highway purposes of \$4.83 per capita. It follows, therefore, that of every dollar collected by the States, counties, cities, townships and other taxing districts only 12.4 cents was used for highway purposes.

Variations Must Be Taken Into Account

On account of the wide variations which exist in different parts of the country as to density of population, road mileage, character of road construction, amount of highway traffic, etc., it is essential in order to make worth while comparisons to make an examination of the incidence of these highway costs in the different groups of States.

In the six States comprising the New England division the total highway income was \$46,455,284 in 1921, or \$6.25 per capita. Of this amount \$11,629,091, or 25.1 per cent, consisted of license fees contributed by the motor vehicle.

The amount received from the Federal Government as Federal aid was \$2,904,636, or 6.2 per cent of the total. The general property taxes and revenues derived from other sources were \$26,031,762; this constituted 56 per cent of the total highway income and amounted to \$3.52 per capita. This indicates that 7.2 cents of every dollar collected by State and local governments was devoted to highway purposes.

The total highway income of the three States comprising the Middle Atlantic division was \$168,305,433, or \$7.50 per capita. Of this amount \$22,340,418, or 13.3 per cent was obtained from motor-vehicle license fees. Bond sales furnished the source of \$59,543,258 of the total, or 35.4 per cent; this was an obligation of \$2.68 per capita for the year. The Federal Government contributed \$7,441,515, or 4.4 per cent of the total amount. The general property taxes and the revenues derived from other sources was \$78,980,242, which was 46.9 per cent of the total highway income and constituted a per capita burden of \$3.52. Of this amount \$3.52 per capita was credited to highway funds, which means that out of every dollar collected from the public only 7.5 cents was used for highway purposes.

In the East North Central Division

In the East North Central division the 1921 total highway income was \$281,139,024, representing a per capita contribution of \$13.10. The motor-vehicle fees amounted to \$27,432,261, or 9.8 per cent of the total. The Federal aid received by these States amounted to \$11,887,987, or 4.2 per cent of the total highway income. Out of the per capita tax collection \$6.50 was credited to the highway account, which indicates that 14.4 cents out of every dollar of public revenues was used for highway purposes.

In the year 1921 the total highway income of the West North Central division amounted to \$153,642,716, or \$12.25 per capita. The motor-vehicle fees constituted \$20,574,538 and represented 13.4 per cent of the total highway income. The revenues derived from Federal aid were \$14,636,169, or 9.5 per cent of the total. The total public revenues in this division of States were \$539,197,660 after subtracting the fees received from motor vehicles. These

total collections from the public represented a per capita burden of \$43, \$6.70 of which was collected for highway purposes, which means that out of every dollar collected 15.5 cents could be designated as highway income.

The 1921 highway income for the South Atlantic division was \$137,657,698, or \$9.85 per capita. The revenues derived from motor-vehicle fees and gasoline taxes were \$11,860,998, or 8.6 per cent of the total. Of the total highway income Federal aid constituted 8.2 per cent, or \$11,267,126. Of the total income only \$3.40 was devoted to highway purposes, which means, however, that 16.8 cents out of every dollar collected from the public was credited to the highway account.

In the East South Central division the total highway income was \$60,280,684 in 1921, which amounted to \$6.80 per capita. The motor-vehicle fees and gasoline taxes, \$5,108,387, represented 8.5 per cent of the total highway income. The States in this division received \$5,281,475 as Federal aid, which constituted 8.7 per cent of the total. In this division the total public revenues, exclusive of motor-vehicle fees and gasoline taxes, were \$155,501,192, or \$17.55 per capita. This total per capita tax collection included the \$2.70 which went for highway purposes, which means that 15.3 cents out of every dollar collected were turned over to the highway fund.

West South Central Division

The total highway income in the West South Central division was \$138,504,160, which represented a per capita burden of \$13.50. The motor-vehicle fees and gasoline taxes amounted to \$7,496,965 and constituted 5.4 per cent of the total highway income. The aid derived from the Federal Government was \$10,929,721, or 7.9 per cent of the total highway income. After making an allowance for the revenues derived from motor-vehicle fees and the gasoline taxes, these States collected \$235,959,540, or \$23 per capita. Of this amount \$3.70 was destined for highway purposes, or 16.1 cents of every dollar collected.

The States of the Mountain division raised \$61,367,959 in 1921 for highway purposes, which represents a per capita burden of \$18.40. Seven per cent of the highway income, \$4,305,524, was derived from motor-vehicle fees and gasoline taxes. The Federal Government contributed toward highway improvements \$9,731,542, which constituted 15.8 per cent of all highway income. Of every dollar collected from the public 16.8 cents were credited to the highway funds.

The total highway income in the Pacific division was \$102,084,938 in 1921, amounting to \$18.30 per capita. The motor-vehicle license fees and gasoline taxes were \$11,877,984, or 11.6 per cent of the total. The Federal-aid receipts were \$5,253,105, which constituted 5.1 per cent of the total highway income. Of the total amount collected from the public \$7.75 was devoted to highways, and 13.1 cents out of every dollar collected were used for highway purposes.

Per Capita Allocations

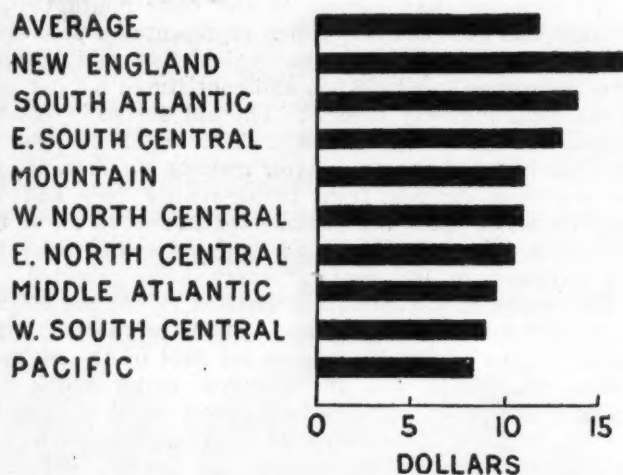
As the per capita allocations present a good many variations in the several groups of States, it may be of interest to compare the several items by groups.

The average per capita income for the whole country for rural highway purposes was \$10.90. In four of the divisions, New England, Middle Atlantic, South Atlantic and East South Central, the per capita highway income was less than the average for the country, and in the remaining divisions it was above the average. The per capita income of \$6.25 in New England was the lowest found in any group and the \$18.40 of the Mountain States was the highest, although the Pacific States, with \$18.30, were a close second. In both of these groups it will be

noted the per capita highway income was almost three times as large as in New England. This wide variation is explained by the fact that in these Western States the total income exceeded by very substantial amounts the total highway income of the New England States, while at the same time the population in the New England area was far in excess of the population of the two Western groups. In the Mountain States, where the per capita highway income was \$18.40, the density of population based upon the 1920 census was only 3.9 persons per square mile.

In the New England States, where the total highway income averaged only \$6.25 per capita, the density of population was 120 persons per square mile, and in the Middle Atlantic States, with a population density of 222 persons per square mile, the per capita highway income was \$7.50. In general it may be said that the per capita highway income tends to vary inversely with the density of population.

The motor-vehicle revenues consisted almost wholly of the fees charged for licenses issued for the operation of automobiles, motor trucks and motor vehicles. Gasoline taxes are also included, but in 1921 these taxes amounted to only a small sum. The collection of these revenues exacted from motor-vehicle owners and users may be summarized as follows. The average amount paid by the owners is also shown.



Average highway income derived from motor vehicles, per motor vehicle, 1921, by geographic divisions

Division	Amount of Motor Vehicle Revenues Credited to Highway Income, 1921	Number of Motor Vehicles	Average Revenue per Motor Vehicle
New England	\$11,629,091	706,312	\$16.40
Middle Atlantic	168,305,433	1,774,614	9.55
East North Central..	27,432,261	2,602,617	10.50
West North Central..	20,574,538	1,871,157	10.95
South Atlantic	11,860,998	859,908	13.80
East South Central..	5,108,387	391,232	13.05
West South Central..	7,496,965	834,209	8.95
Mountain	4,305,524	399,160	11.00
Pacific	11,877,984	984,171	8.30
Total	\$122,626,166	10,423,380	\$11.80

In this year the owners and operators of motor vehicles contributed \$122,626,166, which was included as a part of the total highway income for the country. Averaging this amount over the 10,423,380 motor vehicles which were registered results in an average payment of \$11.80 per motor vehicle.

In the New England States the average was the highest,

\$16.40. This was wholly due to the higher scale of license fees charged because there was no gasoline tax in effect in that year in any of these States. In the Pacific States the highway burden placed upon the user of the road, \$8.30, was the lowest. The variations are almost wholly due to the differences in the scale of license fees.

The ratio which the motor-vehicle revenues bore to the total highway incomes in the several sections of the country is shown below:

Division	Ratio of Motor Vehicle Fees and Gasoline Taxes to Total Highway Income, 1921 Per Cent
New England	25.1
Middle Atlantic	13.3
East North Central	9.8
West North Central	13.4
South Atlantic	8.6
East South Central	8.5
West South Central	5.4
Mountain	7.0
Pacific	11.6
Average	10.6

For the country as a whole the motor vehicles contributed 10.6 per cent of the total highway income. The range was from 5.4 per cent in the West South Central States to 25.1 per cent in the New England States. Outside of the New England States the highest ratio of motor-vehicle revenues to total highway income was 13.4 per cent in the West North Central States.

Portion Raised by Bonds

That part of the total highway income which was derived from the sale of bonds varies widely in the different States and geographical divisions. The ratio of the amounts of money thus raised for highway purposes to the total highway income is set forth in the following tabulation:

Division	Revenues Derived from Sale of Bonds, 1921 Amount	Per Cent of Total Highway Income
New England	\$5,889,745	12.7
Middle Atlantic	59,543,258	35.4
East North Central	101,550,318	36.1
West North Central	34,291,178	22.3
South Atlantic	67,406,730	49.0
East South Central	25,551,347	42.5
West South Central	82,127,751	59.3
Mountain	19,908,036	32.4
Pacific	41,840,910	41.0
Total	\$438,109,273	38.1

For the country as a whole \$438,109,273, or 38.1 per cent of the total highway income, was obtained from bond issues. In the West South Central States the largest proportion of highway income, 59.3 per cent, was represented by State and local indebtedness. In the New England States the smallest part of the year's highway funds, 12.7 per cent, was raised in this manner.

Exceptions in the Groups

In all of the groups of States, with the exception of the New England States, the West North Central States and the Mountain States, over a third of money devoted to highway work was obtained through bond issues. In only one of the divisions, the West South Central States, did the income from bonds amount to more than half of the year's total highway income.

The per capita obligations incurred through these bond issues for highway purposes vary in these several groups as shown in the following statement:

Division	Per Capita Highway Bond Issues, 1921
New England.....	\$0.80
Middle Atlantic.....	2.68
East North Central.....	4.70
West North Central.....	2.75
South Atlantic.....	4.80
East South Central.....	2.90
West South Central.....	8.00
Mountain.....	6.00
Pacific.....	7.50
Average.....	\$4.10

In the New England States, because of the large population and the relatively small amount of bonds issued, the per capita obligation of 80 cents was lower than in any other section. The highest per capita obligation was found in the West South Central States, where the income from bond issues amounted to \$8 per capita.

To the total highway income of 1921 the Federal Government contributed \$79,333,226, or 6.9 per cent. In the following tabulation are shown the proportions which these Federal funds bore to the total highway incomes of the several groups of States.

Division	Federal Aid, 1921, Per Cent of Total Highway Income
New England.....	6.2
Middle Atlantic.....	4.4
East North Central.....	4.2
West North Central.....	9.5
South Atlantic.....	8.2
East South Central.....	8.7
West South Central.....	7.9
Mountain.....	15.8
Pacific.....	5.1
Average.....	6.9

The variations in the ratios of Federal aid funds to the total highway income of these several groups of States depend upon the magnitude of the highway construction programs and upon the amount of forest-road construction by the Federal Government in each of the States, and also upon the apportionments according to the provisions of the Federal law.

Taxes from General Property

That part of the total highway income derived from general property and from other sources, chiefly taxes, amounted to \$509,369,231, or 44.4 per cent of the total highway income. Its relation to the rest of the highway income in various groups of States is indicated in the following table:

Division	General Property Taxes and Other Sources of Revenue for Highway Purposes, 1921	Per Cent of Total Highway Income
New England.....	\$26,031,762	56.0
Middle Atlantic.....	78,980,242	46.9
East North Central.....	140,268,558	49.9
West North Central.....	84,140,831	54.8
South Atlantic.....	47,122,844	34.2
East South Central.....	2,339,475	40.3
West South Central.....	37,723,723	27.4
Mountain.....	27,422,857	44.8
Pacific.....	43,112,939	42.3
Total.....	\$509,369,231	44.4

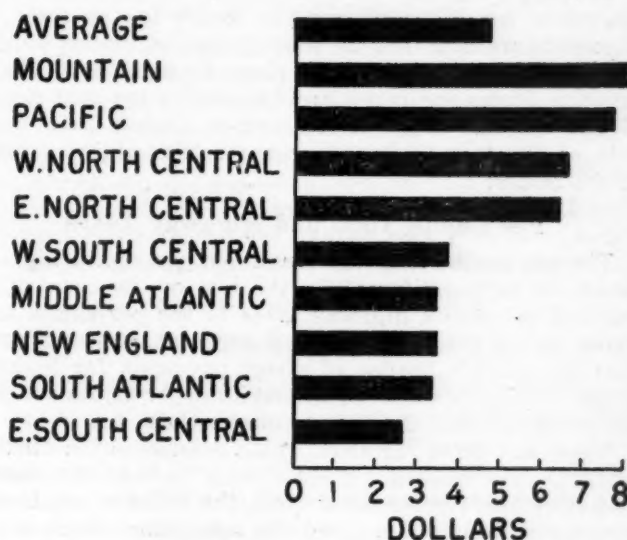
The largest amount of revenues raised from taxes is found in the East North Central States, where the direct contribution of taxpayers amounted to \$140,268,558, just half of the total highway income. In the New England States the percentage of total highway income derived

from taxes was the highest and in the West South Central States it was the lowest. The percentage variation in this case is the inverse of the percentage of highway income raised through bond issues as seen in the tabulation.

It will be observed that those groups of States which showed the highest percentages of the total highway income derived from taxes showed the lowest percentages of highway revenues derived from bond issues. In the New England States 56 per cent of the total income was derived from taxes and only 12.7 per cent from the proceeds of bond issues.

Extreme in West South Central States

At the other extreme are found the West South Central States, which raised 59.3 per cent of their highway income through bond issues and only 27.4 per cent through general property taxes and other taxes. It can be said in considering the sources of highway income in these different groups of States that the ratio of revenues derived from taxes varies inversely with the ratio derived from bond sales.



Per capita burden of highway income derived from general property taxes, 1921, by geographic divisions

The burden which the collection of these taxes for highway purposes placed upon individuals is indicated in the following tabulation:

Division	Per Capita Highway Income Derived from Taxes
New England.....	\$3.52
Middle Atlantic.....	3.52
East North Central.....	6.50
West North Central.....	6.70
South Atlantic.....	3.40
East South Central.....	2.70
West South Central.....	3.70
Mountain.....	8.20
Pacific.....	7.75
Average.....	\$4.82

The direct payments made by the public for rural highway construction and improvements aside from the revenues derived from other sources vary considerably in the different sections of the country. In the East South Central States the direct payments of taxpayers amount to only \$2.70 per capita; that is the lowest per capita payment. The highest per capita payment is found in the Mountain States, where the contribution from taxpayers is \$8.20. For the country as a whole the per capita tax burden was \$4.82.

In order to determine how much of a burden the taxes collected for highway purposes really are it is of interest to compare the per capita burden of the total taxes paid by the public and the per capita taxes which are collected for highway purposes. In the following tabulation this relationship is clearly set forth:

Division	Total Taxes, Fees, Etc., per Capita, 1921	Highway Taxes per Capita Amount	Per Cent of Total Taxes
New England	\$49.00	\$3.52	7.2
Middle Atlantic	47.30	3.52	7.5
East North Central	45.20	6.50	14.4
West North Central	43.00	6.70	15.5
South Atlantic	20.10	3.40	16.8
East South Central	17.55	2.70	15.3
West South Central	23.00	3.70	16.1
Mountain	48.90	8.20	16.8
Pacific	59.20	7.75	13.1
Average	\$38.80	\$4.82	12.4

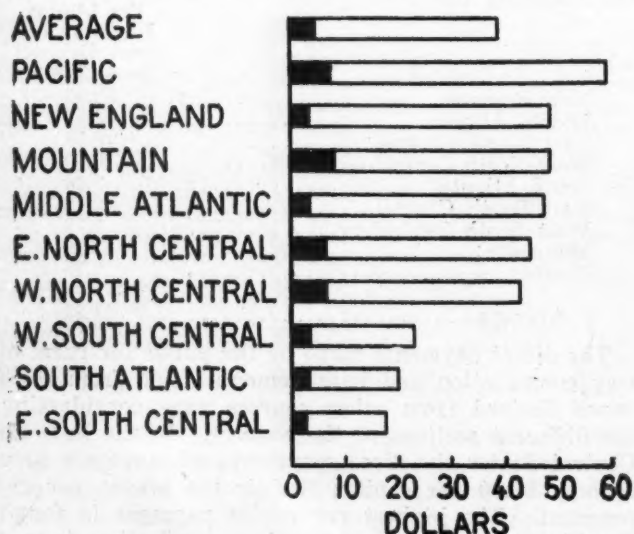
In comparing the relation which the per capita tax payments for highway purposes bears to the total tax payments, we note that the country can be divided roughly into two sections. In the New England and Middle Atlantic States the ratios are 7.2 and 7.5 per cent respectively. In this northeastern section slightly over 7 per cent of the taxes collected accrue to the highway funds of the States.

Per Capita Total and Highway Taxes

The per capita total taxes and the per capita highway taxes are quite uniform. In the rest of the country the ratio of per capita highway taxes to the per capita total taxes varies from 13.1 to 16.8 per cent, showing again that the relative burden of direct payments for highway purposes is quite uniform, although the per capita amounts differ considerably for the various sections.

There are three variables which determine the burdens of these expenditures for individuals, namely the amount of money spent per mile of road, the miles of roads constructed and maintained and the population which has to make the financial contributions. In order to make comparisons which recognize each of these three variables it is important to determine what the expenditures have been per person per mile of road.

In 1921 the total highway expenditures for all rural highway purposes were \$1,036,587,772. In the following



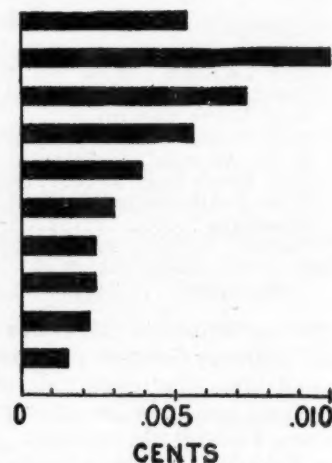
Comparison of per capita highway taxes with total per capita taxes, State and local, by geographic divisions

tabulation the resulting per capita expenditure in each of the sections is shown in relation to the total mileage of road in the corresponding sections with the purpose of bringing out the per capita expense per mile of road:

Division	Mileage of Rural Highway	Highway Expenditures per Capita	Highway Expenditures per Person per Mile of Road, Cents
New England.....	83,296	\$6.10	0.0073
Middle Atlantic.....	186,935	7.20	.0039
East North Central...	412,753	12.40	.0030
West North Central...	759,820	11.80	.0015
South Atlantic.....	365,567	7.70	.0022
East South Central...	242,745	5.75	.0024
West South Central...	416,617	10.20	.0024
Mountain	306,382	17.15	.0056
Pacific	167,180	16.90	.0101
Total	2,941,294	*9.80	*.0054
*Average.			

The highway expenditures per person per mile, while they averaged 0.0054 cent, ranged from 0.0015 cent in the West North Central States to 0.0101 cent per person per mile in the Pacific States.

AVERAGE
PACIFIC
NEW ENGLAND
MOUNTAIN
MIDDLE ATLANTIC
E. NORTH CENTRAL
W. SOUTH CENTRAL
E. SOUTH CENTRAL
SOUTH ATLANTIC
W. NORTH CENTRAL



Highway expenditures per person per mile of road, 1921, by geographic divisions

The highest expenditure per person per mile of road was found in the Pacific States, where it amounted to 0.0101 cent, or 670 per cent of that in the West North Central States.

The total highway expenditures for 1921 were \$1,036,587,772; of this amount only \$413,241,662, or 39.8 per cent, was spent by or under the supervision of State highway departments. The remaining 60.2 per cent of the expenditure was made by counties, townships and highway districts.

The per capita income was the largest in the Mountain and in the Pacific divisions. The largest increase over 1914 was in the West South Central States, where the per capita income in 1914 was only \$1.75, and in 1921 \$13.50, an increase of 770 per cent. The greatest increase in per capita income between 1904 and 1921 was in the South Atlantic States, where in 1904 it was only 72 cents and in 1921 \$9.85, an increase of 1415 per cent.

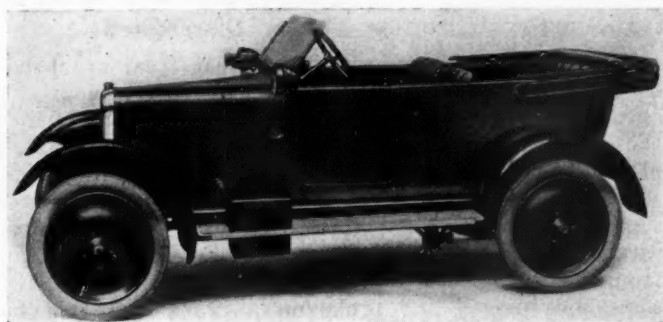
The present indications are that the revenues derived from various sources will increase, especially because so many States have recently enacted gasoline tax laws and because some of the States which have been collecting gasoline taxes contemplate increasing the rates charged. If we assume that there will be no increase in highway expenditures, the additional funds derived from motor-vehicle revenues may result in a decrease in the amount collected as taxes or a decrease in the amount raised by bond issues or in both.

British Firm Introduces Popular Priced, 9-Hp. Four

New Rover model has pressure lubrication, magneto ignition and pump in water circulating system with overhead valve type engine of 65.4 cu. in. displacement. Two or four-passenger bodies supplied.

IN the case of the removal of tariff on automobiles the Rover Co., Ltd., of Coventry, England, has placed a new, light car on the market fitted with either "two-seater" or "four-seater" body. Because of the taxes this type of car, with low horsepower and small piston displacement, has a very considerable vogue in the British Isles; and while it lacks the speed of our popular priced American cars, it gives unusually high mileage per gallon of gasoline and is surprisingly comfortable.

The Rover model, which has just been introduced with a 9-hp. four-cylinder overhead valve type of engine, is of-



Rover 9-hp. light car with four-passenger body

ferred with either body at £180 or with an electric starter at £192. Apart from its unit powerplant the new Rover closely resembles the same maker's 8-hp. air cooled two-cylinder type which, since it was introduced in 1919, has sold in large numbers.

The present price of this model is £160 with a four-passenger body.

The design of the new engine is due to F. Poppe, who designed the original pre-war Morris powerplant. The dimensions adopted are 60 mm. bore and 95 mm. stroke, giving a displacement of 1074 cc. (65.4 cu. in.). Overhead valves with duralumin pushrods are used, inclosed by a cast aluminum cover. The crankshaft is of 1 3/8 in. diameter with two bearings; cast iron pistons, with two compression rings and a scraper ring in the skirt, represent a diversion from usual British light car practice, aluminum pistons being used in the majority of cases.

Further Variations from Usual Practices

Other variations from normal practice in light car engines are the adoption of pressure lubrication for the crankshaft and big end bearings, as well as for the rocker shaft of the overhead valves, and the inclusion of a pump in the water circulating system. Magneto ignition is used, the magneto shaft, driven from the camshaft by a silent chain, also drives the water pump. The generator is driven by a duplex roller chain, while the engine starter is a separate unit attached to the flywheel casing.

Although rated at 9 hp., the engine develops just over 20 hp. at 3000 r.p.m., a speed of rotation which it is designed to attain as a regular thing. Road speeds in excess

of 50 m.p.h. are claimed. The three-speed gearbox has ratios of 4.84, 8.57 and 16.44.

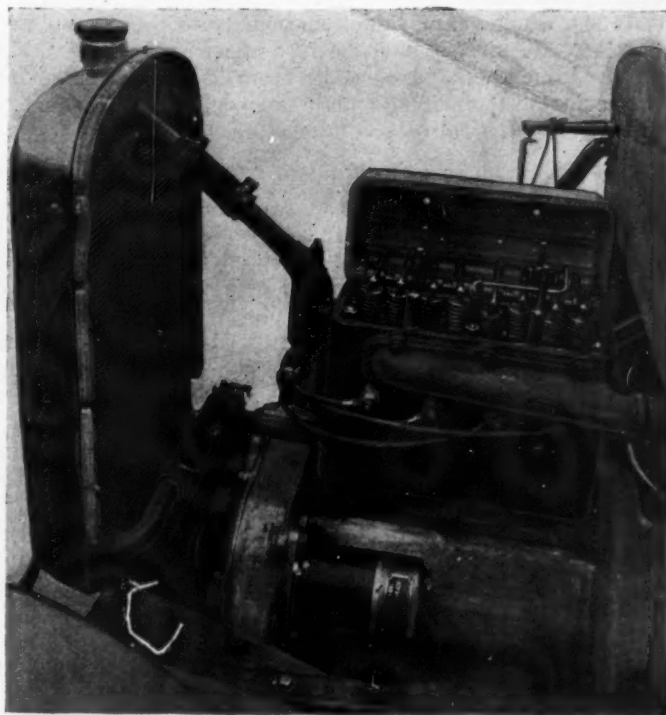
The clutch is of the plate type, while the 1 3/4 in. diameter propeller shaft is exposed, with a fabric joint at the front end and a sliding universal at the rear. The final drive is by worm gearing below the rear axle center. Both sets of brakes act inside of the rear wheel drums.

Some of the Dimensions

Some of the leading dimensions are: Wheelbase, 94 in.; track, 48 in.; overall length, 132 in.; overall width, 63 in.; weight with either two-passenger or four-passenger body, approximately 1250 lb.

There is reason for believing that this new model will experience a big demand on British standards, for it is a type that appeals forcibly to a large proportion of British motorists and potential car owners, owing to its economy in running costs and taxation. Incidentally, the gasoline mileage is claimed to be 45 per Imperial gallon (37.5 per U. S. gallon).

THE ignition on the Hansa Lloyd car, described in our issue of May 22, is not by a battery system as stated in the article but by a Robert Bosch magneto. The magneto is combined with the generator, and the interrupter-distributor unit projects from the generator-magneto unit in about the same way it usually projects from the generator, which may have misled our correspondent.



Powerplant of new 9-hp. Rover

Precautions Needed in Production of Automotive Drop Forgings

Wyman-Gordon develop special machine to prove running balance of crankshafts, etch section to show direction of flow in finished product, in addition to standard tests.

DIFFICULTIES in crankshaft manufacture have been added to during the past fifteen years by the appearance of the six and eight cylinder vertical engines, which two types have cranks in more than one plane, and also by the constant increase in engine speed, which has necessitated much more accurate balancing than was customary in the early days of the industry. The material problem also has compelled closer attention than was given it formerly. Flaws in the steel must be carefully guarded against and test samples must be taken from every heat of steel received, and analyzed.

Like many other components of the motor car, the crankshaft owes a good deal of its development to the parts industry. Most of the crankshafts for the early experimental engines were worked out of solid slabs of steel, which involved an enormous amount of machine work, but as soon as production assumed fair proportions the industry turned to the drop-forged crank. These are generally finished only on the bearing surfaces, so the amount of machine work is greatly reduced.

While a few of the largest car manufacturers always have forged their crankshafts themselves, the majority are having their forgings made by specialists. Much expensive equipment is needed for forging large crankshafts, and unless this equipment can be kept busy practically the whole year, it adds materially to the cost of production. Besides, it must be recognized that the skill and matured judgment which come from specialization in one particular branch of the industry are important factors in turning out quality products at reasonable cost.

Heat Treatment of Forgings

Among specialists in crankshaft forgings, Wyman-Gordon of Worcester, Mass., and Harvey, Ill., have always occupied a prominent position. The firm was in existence when the automobile industry originated, and forged crankshafts for many of the pioneers. Among other contributions to the industry, they claim credit for the introduction of heat treatment of the completed forging, for the purpose of refining the grain and restoring the physical properties of the steel. This is universal practice today, but there was a time when the cranks were machined in the condition in which they came from the forge. Owing to the high temperature to which the steel must be raised in order to cause it to flow properly under the hammer, the grain structure deteriorated greatly, and in consequence these untreated crankshafts often broke in service.

In this connection it is interesting to relate what first led Wyman-Gordon to take up the heat treating of drop forgings. About 1885 they manufactured car knuckles for railroad cars and during severe weather large num-

bers of these knuckles broke, the sections showing a coarse crystalline grain. They called into consultation Henry M. Howe, the noted metallurgist of Columbia University, and he suggested heat treatment as a remedy. The forgings were heated to a cherry red, quenched in water and withdrawn before they had fully cooled. This solved the problem.

Crystallization Theory Discredited

When it was first suggested to heat treat crankshaft forgings, the proposal was not taken very seriously by automobile engineers. It was then common to ascribe the failures of crankshafts to crystallization, and this explanation was apparently borne out by the coarse grain structure at the section of the break. It was the contention of Wyman-Gordon, however, that this grain structure was not developed in service but existed in the crank from the time it was forged, and to prove this point they sometimes nicked and broke off a crankshaft that had failed, in a point where it could not possibly have been subjected to any excessive strain, as, for instance, at the front main bearing, showing that the grain there was the same as at the section where the failure had occurred.

Today the great majority of all crankshafts are made of so-called 45 point carbon steel. From the standpoint of taking precautions against breakage there is less advantage than formerly in using alloy steels, for now the cranks are so liberally dimensioned in order to secure rigidity that crankshaft breakage has become almost a thing of the past. Alloy steel has an advantage, however, in that it provides a harder bearing surface and thus insures longer wear.

At the Wyman-Gordon works the raw material comes almost exclusively in the form of square section bars, one of the reasons for preferring square to round bars being that the former can be stacked more readily. Samples for analysis are taken from bars of each heat. Ordinarily only a certain proportion of the bars of each heat are analyzed, but if any of the tests made show the tolerances allowed by the specifications to be exceeded the whole lot of bars in the heat may be analyzed. Samples are taken by drilling both from the middle and from near the edge of the bar at the end. Records are thus kept of every heat of steel that goes into crankshafts.

In handling the raw material, all bars of the same heat are segregated; each heat is given a number and this number is stamped on all the forgings made from it, which makes it possible to give all forgings the proper heat treatment.

It has been found that steels of the same grade do not always respond to heat treatment in the same way. This is illustrated by the following table, in which test results

from 107 different heats of steel are summarized. The chemical compositions given are the averages of the heats, and the physical test results given represent the average of tests of samples from ten bars selected at random from each heat.

These test results, we are informed, were all obtained on actual production work. It is to be noted that in the table the different heats of steel are grouped according to the draw temperature that was found to be necessary in order to meet the guarantee on this grade of steel.

A study of the table will indicate that there is very little variation in the chemical analyses and that the results obtained with the various draw heats are all practically identical. This shows the necessity of keeping all material separate if accurate work is to be done in the heat treating.

Group	Draw	C.	Min.	P.	S.	Yield Point, Lb. Per Sq. In.	Tensile Strength, Lb. Per Sq. In.	Elong. in 2 In., Per Cent	Cont. in Area, Per Cent	Brinell Hardness	Number of Tests Averaged
A....	980	.43	.65	.012	.043	74,280	111,220	20.1	51.3	228	60
B....	1000	.43	.69	.016	.041	77,540	115,900	20.8	52.8	238	110
C....	1020	.47	.69	.018	.041	77,300	115,950	21.6	53.6	236	90
D....	1040	.47	.73	.021	.044	77,500	115,750	21.3	52.9	238	230
E....	1060	.46	.71	.024	.042	77,420	114,980	21.6	54.3	238	120
F....	1080	.46	.71	.028	.046	79,100	117,200	20.8	53.1	240	170
G....	1100	.45	.75	.021	.042	76,900	114,600	22.1	55.2	241	110
H....	1120	.45	.77	.032	.044	78,500	115,750	21.7	56.0	243	190

Before the drop forging process is begun the stock is sheared off to the proper lengths, this shearing operation being performed on most of the stock while cold; but the largest section bars, 5 by 5 in., have to be heated to redness so as to reduce their resistance to shearing.

In the drop forging of a crankshaft there are a number of successive operations performed on various types of machine, including roughing, breakdown, finishing and positioning. These operations are carried on in hammers, power and hydraulic presses.

At the flywheel end a block of material is provided which serves for handling in the forming operations and is later worked up into the flywheel flange in an up-setting machine. As the forging passes through the different operations the scale is constantly removed by a jet of compressed air or steam.

Naturally, the hammers and presses are arranged in such a way that the cranks have to be moved about as little as possible in passing through the forging process, and to further economize on manual labor they are supported by tackle while transported from the furnace to the hammer and from one hammer or press to another, the workman merely balancing it.

Control of Furnace Temperature

After the forging is completed it is heat treated, and this is done in oil-fired furnaces which were built by Wyman-Gordon themselves. The temperature in these furnaces is controlled automatically and a record of the temperature of each furnace is traced, showing the drop when it is being charged, the gradual increase in heat after the charging is completed and the period of constant temperature following. The quenching baths are located directly in front of the furnaces and all handling of the forgings in connection with the heat-treating operations, as well as the opening and closing of the furnace doors, is done by power.

Coupons are attached to a certain percentage of the shafts, from which test specimens are turned up for tension and other tests. Hardness tests are made on all crankshaft forgings. Each shaft has the heat number of the steel stamped on it, which is a guide in determining the heat treatment to be given it.

One of the most important operations in the machining

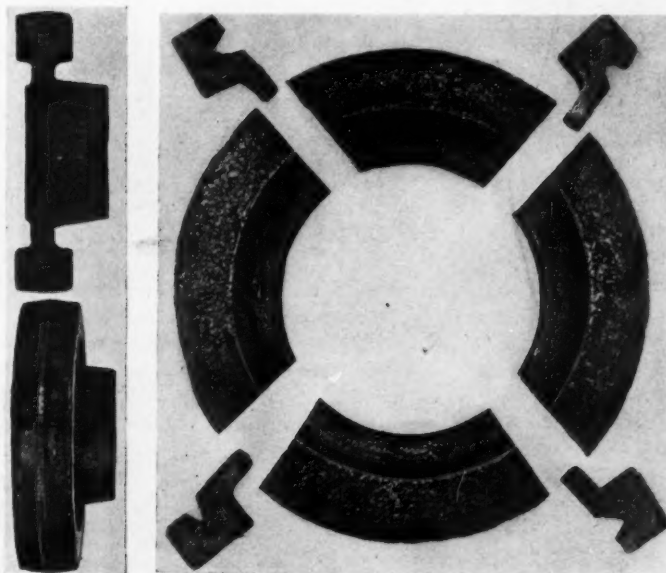
of a crankshaft is that of centering. The crankshaft is designed to be in complete static balance around a certain axis, and unless the centers are placed on this axis it will be out when finished. Accurate centering is the more necessary because the majority of the crankshafts are not machined all over. In addition to accurate centering, accurate alignment and accurate indexing are highly important.

Six and eight-throw crankshafts are placed in a mass centering machine of special design, in which the best possible index is determined before the centering operation is performed. The machine indicates the index of all pins and the length of throws simultaneously to the operator. First the crankshaft is adjusted by the operator to give the best possible index, and the starting point

is then marked on the shaft. Next the crankshaft is centered on the axis determined by this operation.

Accurate centering is even more important with four-cylinder crankshafts, for if the centers should be out of the plane through the mass axis and parallel to the cranks a great deal of metal must often be removed in order to obtain a proper balance. This is guarded against by centering in a special machine in correct relation to the mass center of the shaft. An inspection is made to determine that there is ample stock for machining on both the main journals and the crank pins.

Reference has been made already to the tests of all stock that comes into the plant, and the Wyman-Gordon Worcester plant is unusually well equipped for the carrying out of both chemical and physical tests. The equipment for mechanical tests includes machines for making tensile, impact, torsion endurance and hardness tests. No



Left—Crown gear forging and sections of same, showing uniformity of grain flow, which tends to reduce distortion during quenching. Right—Drop forged gear blank and section of same showing grain flow

less than three different machines are available for making impact tests, the Izod, Charpy and Olsen. This equipment was installed during the war, when the concern was busy turning out crankshafts for aircraft engines, the specifications of which included the required resistance to impact; but such tests are now rarely called for in the specifications of crankshaft forgings.

All hardness tests are made on Brinell machines. The equipment of the laboratory also includes a Stanton endurance machine, in which a hammer falling through a certain distance delivers a blow to a cylindrical test specimen which is constantly being rotated so that blows strike it alternately on opposite sides. In addition to the apparatus enumerated, there is a complete outfit for making micro-photographs of etched sections and also a low-power microscope for the direct observation of broken sections under moderate magnifications.

Typical Material Defects

Having enumerated some of the laboratory equipment, it may be of interest to give a few of the results obtained. In the halftone reproduction showing a number of sections, 5 represents a section of a bar showing "ingotism." The formation along the edges consists of what are known as chill crystals, and between these and the inner portion, consisting of free crystals, there are definite lines of demarkation, represented by blowholes. Diagonal cleavage lines extend between opposite corners.

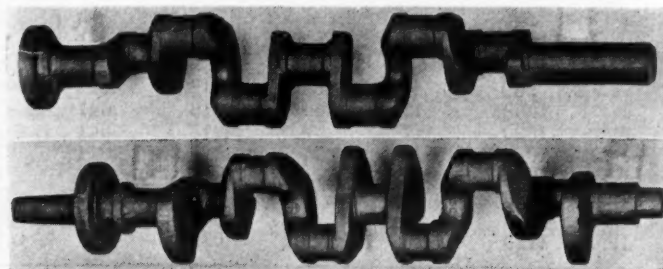
In the same figure, 6 is a sample of "dirty" steel, the dirt being introduced through improper conditions in melting. The two sections 7 and 8 represent two conditions which can both be obtained from the ingot marked 1. These sections show an effervescent steel, the effervescence being due to the gas bubbles in the ingot, which in bar 1 are seen to be directly under the surface of the bar. The ingot marked 2 is of the same kind of steel as No. 1, but here the gas bubbles have been driven nearer the center, and 9 represents a section of a bar rolled from this ingot.

Section 10 is of a forging made from bar 9. This shows deep-seated blowholes, which, however, have been forced in the direction of the flash by the blows in the press. Ingot 3 shows a deep piping, and section 11 is of

a bar rolled from this ingot, indicating insufficient cropping to remove the pipe. At 4 is shown an ingot with a hot top. This results in a minimum loss in cropping and a maximum yield of good, sound steel.

During recent years the metallurgical staff of the firm has done a good deal of work on grain flow in drop forgings, and sectioned parts with the sections etched have been exhibited at some of the industrial shows. Several photographs of these etched sections are shown herewith. It is claimed that, the same as a piece of wood or other fibrous material, the forging offers greater resistance to bending stresses when the bending force is in such a direction as to tend to stretch and compress the fibers than when in such a direction as to tend to separate them.

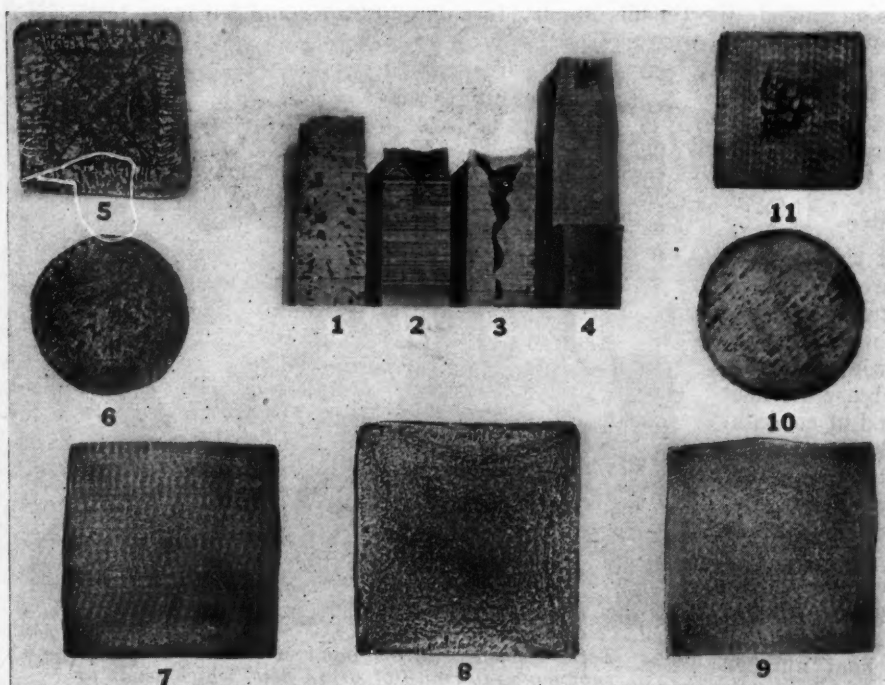
This is considered of particular importance in connection with gear blanks, the forging of which has been taken



Typical six-throw-three-bearing crankshafts without and with balance weights

RESULT OF TEST OF TYPICAL THREE-BEARING SIX-THROW CRANKSHAFT

Before Counterweighting		(Within Forging Limits) After Counterweighting	
R.P.M.	Run Out	R.P.M.	Run Out
1000	.0021	1000	.0000
1100	.0051	1100	.0000
1200	.0075	1200	.0001
1300	.0121	1300	.0001
1400	.0151	1400	.0001
1500	.0255	1500	.0002
1600	.0274	1600	.0002
1700	.0373	1700	.0003
		1800	.0003
		1900	.0003
		2000	.0006
		2150	.0015
		2200	.0021



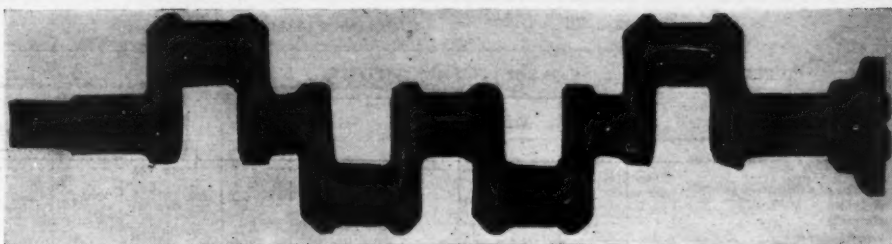
Sectioned ingots and bars rolled from same material, showing various defects

up by Wyman-Gordon comparatively recently. One of the photos shows a gear blank both complete and in section, and from the fiber lines it will be realized that the grain flow crosses the root of the tooth—where the stresses are at a maximum—either at right angles or nearly at right angles. It is claimed that a gear cut from such a blank offers more resistance to tooth breakage than a gear made from a blank of the same material but formed by other processes.

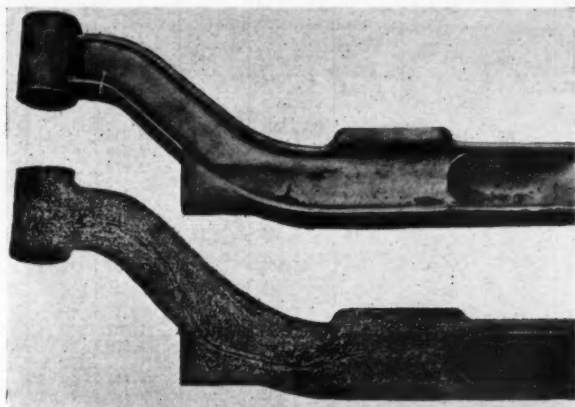
A photograph is also shown of a bevel gear blank from which four thin sections have been cut at equal angular distances and the sections etched and included in the photograph. The object here is to show that the grain flow is exactly the same at all parts of the ring, and the conclusion is drawn that, owing to the uniformity of the grain flow, there will be less distortion of the ring on hardening.

In connection with crankshafts there has been a great deal of interest recently in counterbalancing, and Wyman-Gordon have succeeded in forging balance weights integral with the crank arms. While it is not impossible to provide balance weights of practically any moment desired, the amount of forging work required and the technical difficulties increase with the size of the counterweights relative to the size of the shaft itself, and as a rule a compromise is made between theoretically complete balancing and economical production. Results obtained from crankshafts with counterweights of a magnitude within the limits of economical production are given in tabular form on the preceding page.

In addition to the difficulty connected with causing metal to flow from the crank arms to form the balance weights, there is the difficulty of securing sufficient draft on the



Etched section of crankshaft showing grain flow



Etched section of front axle showing grain flow

balance weights to make it possible to remove the forging from the die. General practice is to provide a draft of 7 deg. on drop forgings, but on the balance weights Wyman-Gordon have been able to reduce this to 3 deg. where needed.

Before the dies are made for a counter-balanced crankshaft, a form of the counterweights which gives good results and at the same time permits of forging without difficulty is worked out experimentally, the engineering staff of the drop-forging concern co-operating with the designer of the engine in this work.

For making tests of dynamic balance there are available both standard dynamic balancing machines and a special machine developed in the Wyman-Gordon plant. This machine permits of making tests of the crankshaft under practically crankcase conditions and at speeds up to 3000 r.p.m. It has been found very useful in determining values of the various designs of cranks so far as freedom from vibration is concerned.

A photograph of this machine is reproduced herewith. The crankshaft is mounted in it between centers, and its main journals are surrounded by bearing blocks which are spring-supported on pedestals.

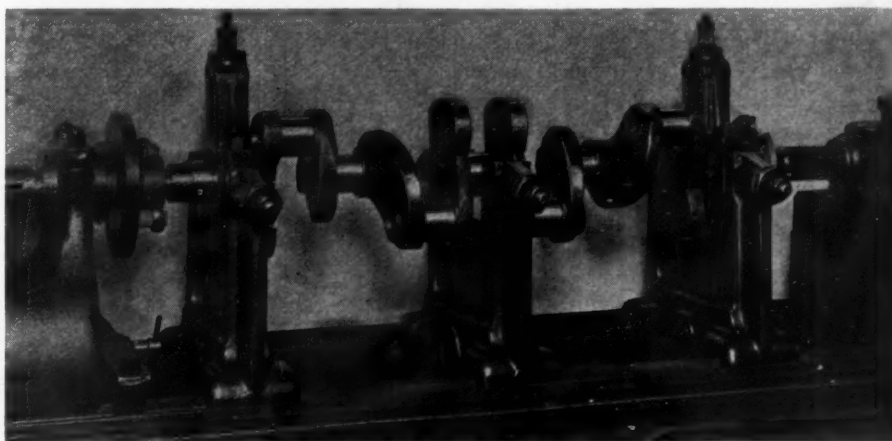
The accompanying table shows results obtained with this testing machine from a typical six-cylinder three-

bearing crankshaft before and after counter-balancing. The amount of counterbalancing on the shaft used in this specific test was within the range of economic production. The photographs show such shafts with and without balance weights.

A BILL has been introduced in the British Parliament seeking permission for the construction of a high speed automobile road. In introducing the bill Sir Leslie Scott said the scheme would give employment to 40,000 persons for two or three years and involved an estimated expenditure of about \$25,000,000. With the toll fixed at two cents per ton per mile, the profits, it was thought, would suffice to pay a fixed interest on one half the capital and dividends of 2, 4 and 7 per cent on the other half in 1928, 1929 and 1930 respectively; only one road, Coventry-Salford, had been definitely decided upon. Among those behind the scheme are Lord Montague of Beaulieu, and the firm of Armstrong-Whitworth.

RESEARCHES on the use of stainless steel for ball bearings are recorded in a paper by Axel Hultgren of the Aktiebolaget Svenska Kullagerfabriken of Gothenburg presented at the recent meeting of the American Society for Testing Materials. The advantage of a non-rusting material for ball bearings are obvious, provided the load capacity obtainable is not much less than that obtained with the standard material (about 1.0 per cent carbon and 1.5 per cent chromium).

Tests were made with stainless steel of American, British and Swedish manufacture. The bearings made from the American stainless steel had a capacity of about 20 per cent that of the standard bearings, while those made from British and Swedish steel had only between 10 and 20 per cent that capacity.



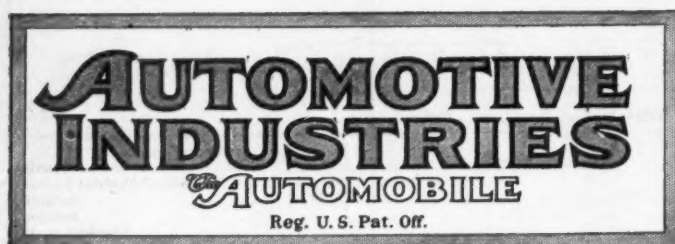
Dynamic balancing machine developed by Wyman-Gordon. In the cap of the central pedestal is supported a micrometer, which is insulated from it. An electric circuit containing a galvanometer is established through the micrometer, and the differences in the micrometer readings when the galvanometer begins to show current flow at low and test speeds, respectively, indicates the run-out at the test speed

Exports of Cars, Trucks

COUNTRIES	GASOLINE PASSENGER CARS								GASOLINE TRUCKS					
	Up to \$500		\$500 to \$800		\$800 to \$2000		Over \$2000		Up to 1 ton		1 to 2½ tons		Over 2½ tons	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Europe														
Austria	4	\$1,771	8	\$5,067	1	\$1,135	3	\$8,376						
Azores and Madeira Islands	5	1,960	1	668	1	1,063								
Belgium	71	28,099	58	38,906	85	87,004	38	107,565						
Bulgaria			1	756	1	1,850								
Czechoslovakia			48	34,848	32	33,397	3	8,405						
Denmark	13	4,559	64	38,592	21	24,002			24	\$11,538				
Finland	59	23,226			6	5,831	2	4,579			16	\$19,146		
France	48	20,108	83	60,176	291	300,583	16	40,832	4	2,954				
Germany														
Gibraltar			10	7,197	8	10,202			7	1,200				
Greece	2	526			2	2,742								
Hungary			6	3,872	6	6,483	1	4,912	155	38,538				
Iceland and Faroe Islands			2	1,382	5	5,018								
Italy	52	12,270												
Latvia														
Lithuania					2	2,507			1	505				
Malta, Goso and Cyprus	3	1,012			109	125,138	13	38,001	10	6,473	6	6,424		
Netherlands	61	25,082	93	62,315	34	36,147								
Norway	41	15,755	50	30,748	29	30,410	1	4,000						
Poland and Danzig			4	2,653	7	7,351	1	2,313						
Portugal	7	2,896	11	12,234	12	12,326	3	6,939						
Rumania	21	6,710												
Russia			246	165,967	140	153,707	30	83,786	115	37,332	8	9,463		
Spain	260	91,659	236	165,435	141	145,765	11	29,549	637	194,951	3	3,718		
Sweden	191	69,404	38	25,881	58	65,232	10	24,514						
Switzerland	8	3,112			4	3,949								
Turkey														
Ukraine			423	268,573	46	50,722	14	45,686	4	3,500	18	15,753		
England	102	50,665			1	1,100								
Scotland	1	495			1	1,600								
Ireland	1	200	13	7,238										
Yugoslavia, Albania and Fiume	2	792												
North and South America														
Canada	89	22,145	509	350,854	619	685,125	62	166,677	46	34,202	124	188,255	14	\$48,371
British Honduras	1	125												
Costa Rica			10	7,273	22	26,226			5	3,027				
Guatemala			3	1,873	1	1,000			2	892				
Honduras	8	1,934	5	3,726	4	4,753								
Nicaragua	1	250	4	2,544	9	11,692			10	3,596	17	22,871		
Panama	10	3,446	7	5,218	7	8,130	1	2,873					1	5,556
Salvador	1	450											2	7,950
Mexico	586	200,775	171	115,494	119	126,348	4	14,536	164	66,863	26	24,750		
Miquelon, Langley and St. Pierre	2	500												
Newfoundland	13	5,426	2	1,180	13	15,773	1	2,313						
Barbados	2	997	12	8,301	10	11,384			3	1,012				
Jamaica	7	2,715	5	3,376	2	1,635			12	5,421	1	1,801		
Trinidad and Tobago	19	6,488			2	2,150					1	356		
Other British West Indies	4	1,378			42	50,238	13	37,884	109	30,934	4	2,955	2	7,800
Cuba	379	120,145	85	157,496	10	11,591	3	7,805	9	6,633			1	2,700
Dominican Republic	27	9,608	3	1,653					4	1,424				
Dutch West Indies	7	3,108												
French West Indies														
Haiti	4	1,500	4	2,857	2	2,223			1	452	1	1,249		
Virgin Islands	2	866												
Argentina	689	263,859	152	107,921	285	303,993	18	52,053	10	9,804	6	11,099	14	31,962
Bolivia	1	60			6	7,995								
Brazil	174	56,846	105	74,691	162	164,427	6	14,104						
Chile	101	21,029	9	6,698	28	32,628	9	29,268	125	41,522	6	8,018		
Colombia	6	1,524	7	5,076	21	19,896	1	2,300	8	2,999	1	4,014	2	10,052
Ecuador	12	3,534			4	4,892			10	3,650				
British Guiana	8	2,912	2	1,282					2	712				
Dutch Guiana														
French Guiana														
Paraguay														
Peru	77	28,714	36	21,119	38	43,022			93	40,419	19	24,791	2	14,266
Uruguay	372	115,026	36	22,021	58	64,454	2	6,047	106	27,003			2	6,505
Venezuela	78	30,461	17	10,670	18	18,390	2	6,426	17	6,245	4	7,247		
Asia														
Aden														
British India	56	21,168	113	71,984	21	21,682			11	8,387	14	16,601		
Ceylon	28	12,724	4	2,530	19	19,563			5	5,460	9	17,035		
Straits Settlements	9	4,016	12	7,363	19	19,887								
China	40	14,082	63	42,627	42	48,708			31	12,076	4	4,970		
Chosen														
Java-Madura			70	49,583	48	47,330					4	4,134		
Other Dutch East Indies			4	2,787	5	4,646								
Hejaz, Arabia and Iraq	9	3,220			6	5,435								
Hongkong	5	1,480			4	5,014			11	5,247	1	826		
Japan	471	137,407	19	11,442	92	98,697			275	87,300	8	12,152	6	22,335
Kwangtung					1	1,013								
Palestine and Syria	124	44,384	14	10,208	22	23,345								
Persia														
Philippine Islands	93	34,067	56	39,618	38	37,617	4	11,144	57	31,350				
Siam			3	2,316										
Turkey					1	1,078								
Other Asia														
Oceania														
Australia	927	346,512	1,393	863,807	988	1,029,397	43	192,131	37	29,807	98	149,922	31	64,100
New Zealand	80	31,824	243	159,996	187	203,153	24	55,217	11	11,058	15	26,007	22	52,047
British Oceania	1	458							2	639				
French Oceania			2	1,315										
Other Oceania														
Africa														
Belgian Congo	23	7,540												
British West Africa			6	3,912	424	435,205	6	15,586	33	31,066	21	21,994		
British South Africa	183	80,117	540	394,803	17	17,122	1	2,500	13	9,586	22	26,494		
British East Africa	28	10,965	20	12,790	16	16,733			1	440				
Canary Islands	4	1,740			2	1,874			4	2,715				
Egypt	6	2,472	15	10,385					2	880				
Algeria and Tunis	5	1,820	1	542										
Other French Africa	11	3,252	3	2,380	2	1,616			2	712	1	1,337		
Liberia	3	1,290												
Morocco	14	5,402												
Portuguese East Africa	6	2,104	8	4,757	7	6,985			1	1,008				
Other Portuguese Africa	6	2,400	1	727	1	1,254			14	6,000				
Spanish Africa	4	1,584	1	772										
Total	5,768	\$2,044,759	5,198	\$3,428,029	4,496	\$4,790,161	346	\$940,321	2,205	\$828,627	460	\$643,174	99	\$273,614

and Tires for April, 1924

ELECTRIC VEHICLES		PARTS	TIRES						COUNTRIES
			Casings		Inner		Solid		
No.	Value	Value	No.	Value	No.	Value	No.	Value	
		\$81							Europe
		236	76	\$1,075					Austria
		1,035,760	401	9,679	401	\$966			Azores and Madeira Islands
		498							Belgium
		816							Bulgaria
		1,285,981	3,743	41,612	1,516	2,446	84	\$2,263	Czechoslovakia
		754	1,921	22,759	1,986	3,292			Denmark
		585,613	140	2,198	8	8			Finland
		10,045							France
		28					8	178	Germany
		5,646	276	4,650	500	568	72	2,000	Gibraltar
		500	6	161					Greece
		423	60	900					Hungary
		51,121	736	6,783	970	1,325	6	142	Iceland and Faroe Islands
		329	35	461	175	324			Italy
			34	443					Latvia
		709							Lithuania
		43,711	848	11,350	552	1,333			Malta, Gozo and Cyprus
		7,273	347	7,298	165	414	50	1,829	Netherlands
		362	84	1,308	224	439			Norway
		7,159	495	6,015	1,967	4,066			Poland and Danzig
1	\$250	1,742			86	284			Portugal
		3,447	35	250	45	168			Rumania
		136,951	2,751	43,438	2,254	4,910	103	3,695	Russia
		44,929	8,852	126,855	8,149	15,096	22	1,446	Spain
		3,389	398	4,631	114	261			Sweden
		834							Switzerland
		110							Turkey
		464,672	11,129	121,717	5,972	12,971	2,773	58,910	Ukraine
		868	116	1,083	200	234	256	7,222	England
		140,230							Scotland
									Ireland
		2,078,106	7,350	77,411	2,833	10,199	384	17,081	Yugoslavia, Albania and Fiume
		688	38	444	70	95			North and South America
		389	70	1,539	93	128			Canada
		4,284	68	1,378	28	117			British Honduras
		2,083	76	1,041	194	367	21	979	Costa Rica
		3,423	136	1,885	121	255	6	150	Guatemala
		26,040	490	7,234	1,015	1,382	62	1,481	Honduras
		590	76	1,735	75	233	18	594	Nicaragua
		84,603	12,895	147,488	11,976	21,374	173	4,598	Panama
									Salvador
		3,397	214	2,757	233	381	8	320	Mexico
		2,886	34	363	81	137	8	270	Miquelon, Langley and St. Pierre
		7,467	378	5,441	337	1,253	32	760	Newfoundland
		5,383	169	2,307	153	362	16	135	Barbados
		2,344	54	947	62	161	15	670	Jamaica
		93,122	6,914	79,055	6,192	11,268	546	14,723	Trinidad and Tobago
		9,818	1,216	12,788	1,195	1,891	101	4,872	Other British West Indies
		908	103	2,557	159	508			Cuba
		973							Dominican Republic
		6,932	265	5,802	376	808			Dutch West Indies
		611	80	784	216	374			French West Indies
1	640	1,024,543	4,957	73,277	3,566	7,996	190	6,186	Haiti
		514	608	1,571	118	323	6	192	Virgin Islands
		547,367	3,493	20,787	3,231	3,052	76	1,576	Argentina
		21,251	1,344	23,007	933	1,870	40	1,193	Bolivia
		16,652	597	11,150	521	1,107	24	969	Brazil
		2,378	272	4,943	242	427			Chile
		1,790	41	514	22	50	16	313	Colombia
		662	44	448	66	96			Ecuador
		152							British Guiana
		103							Dutch Guiana
		29,216	3,681	48,386	2,919	6,129	26	774	French Guiana
		38,570	1,039	12,276	117	217			Paraguay
		21,931	946	9,616	1,887	4,462	6	180	Peru
									Uruguay
		172	162	1,234	280	388			Venezuela
		33,226	752	6,829	696	1,104	175	7,307	Asia
		3,457	1,001	12,278	342	843	65	1,498	Aden
		18,106	120	776			35	671	British India
		12,208	1,208	9,052	289	580	31	417	Ceylon
		13,557							Straits Settlements
		18,932	1,139	11,954	800	1,149	183	4,007	China
		3,064	136	1,251	35	56	30	636	Chosen
		1,022	34	374	48	72			Java-Madura
		1,748	12	518	6	10			Other Dutch East Indies
		194,156	6,415	64,059	3,272	5,362	686	9,102	Hejaz, Arabia and Iraq
		227							Hongkong
		5,348	52	928	76	181	6	191	Japan
		1,665	2	27	24	37			Kwangtung
		30,555	3,278	39,432	4,279	7,742	390	9,361	Palestine and Syria
		208							Persia
			12	140	2	15			Philippine Islands
									Siam
									Turkey
									Other Asia
		213,191	7,658	119,355	4,539	11,576	656	19,547	Oceania
		81,820	5,960	81,716	5,121	13,199	398	15,499	Australia
		331	48	634	30	57			New Zealand
		2,058	36	394	18	35	10	429	British Oceania
		366	25	373	10	21			French Oceania
									Other Oceania
		2,174							Africa
		27,285	74	1,792	91	292	2	52	Belgian Congo
		104,876	4,218	57,187	4,839	11,029	85	2,683	British West Africa
		9,712	452	4,871	1,396	1,671			British South Africa
		2,800	334	4,172	222	496	10	223	British East Africa
		5,909	168	1,457	26	38	70	1,577	Canary Islands
									Egypt
		2,989							Algeria and Tunis
		296	16	290	18	50			Other French Africa
		2,513	78	4,601	78	547			Liberia
		825	4	58					Morocco
		1,995	20	245	40	60			Portuguese East Africa
		2,915					28	619	Other Portuguese Africa
2	\$890	8,673,249	113,135	\$1,402,504	90,896	\$182,767	8,068	\$209,520	Spanish Africa
									Total



JULIAN CHASE, Directing Editor
D. G. O'CONNOR, Assistant Editor
P. M. HELDT, Engineering Editor
W. L. CARVER, Field Editor
WARREN BAKER, Ass't News Editor

NORMAN G. SHIDLE, Editor
HERBERT CHASE, Engineering Editor
DONALD BLANCHARD, Field Editor
C. G. SINSABAUGH, News Editor
D. M. McDONALD, Detroit Representative

Home Office, 239 West 39th Street, New York City
Cable Address.....Autoland, New York
Telephone.....PENnsylvania 0080 New York

BRANCH OFFICES

Chicago—5 So. Wabash Ave., Phone Randolph 6960
Detroit—7338 Woodward Ave., Phone Empire 4890
Cleveland—538-540 Guardian Bldg., Phone Main 6432
Philadelphia—56th and Chestnut Sts., Phone Sherwood 1424
Indianapolis—1212 Merchants Bank Bldg., Phone Circle 8426

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions.....\$3.00 per year
Canada 5.00 per year
All Other Countries in Postal Union..... 6.00 per year
Single Copies 35 cents

Entered as second-class matter January 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Copyright 1924 by THE CLASS JOURNAL COMPANY

Member of the Audit Bureau of Circulations

Member, Associated Business Papers, Inc.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

THE CLASS JOURNAL COMPANY

U. P. C. Building, 239 West 39th Street, New York City

C. A. MUSSELMAN
Vice-President and General Manager
E. M. COREY, Treasurer
HARRY TIPPER, Secretary

A. B. SWETLAND
Vice-President and Manager
W. I. RALPH, Vice-President
E. E. HAIGHT, Western Manager

Owned by United Publishers Corporation, 239 West 39th St., New York;
CHARLES G. PHILLIPS, President; A. C. PEARSON, Vice-President; FRITZ J. FRANK, Treasurer; H. J. REDFIELD, Secretary.

The Automotive Schoolroom

EVERY year the automotive industry learns something new. The lessons taught in one year help in the achievements of the next. In 1920 the chief piece of knowledge accumulated was that excessive inventories should be avoided. Manufacturing plants learned that lesson well; there have been no great stocks of raw and semi-fabricated materials lying about factory yards this year despite a falling off in sales and the consequent decrease in production schedules.

What has 1924 taught so far? For one thing it has taught caution in producing during winter months for a spring demand which may or may not materialize. It has taught the necessity for considering economic trends more seriously than seasonal variations in setting production schedules and in building for future demand. Those companies which did not operate at their fullest capacity throughout the winter months have relatively small car stocks in their own warehouses today and have a dealer organization which is ready to thank them for some very constructive co-operation. The relation of dealer profits to manufacturing stability and the need for manufacturers to

take a larger part in helping to solve the used car problem are other courses which have a prominent position in the 1924 curriculum.

Canadian Exports

AMERICAN automotive export figures for March are published in this issue, but the data on Canadian shipments have not been included as in the past. This serious omission is occasioned by the fact that the Dominion Bureau of Statistics at Ottawa has discontinued, temporarily at least, the compilation of these figures by countries, although total shipments have been made available. The Automotive Division of the Bureau of Foreign and Domestic Commerce in Washington has been making strenuous efforts to get the Canadian data, but up to the present has been unsuccessful, although final word has not yet been received.

It is essential to American manufacturers that the Canadian export figures be available at the same time as are those of the United States. One set of figures without the other is of relatively little value. Trends indicated by the United States figures alone may be entirely reversed when the Canadian shipments are studied and the two sets are correlated.

Lack of funds in the Dominion Bureau of Statistics appears to be the chief reason for discontinuance of these important compilations. It would be desirable for those manufacturers interested to write or wire directly to that department to help impress on Canadian officials the necessity and desirability of publishing this particular set of export statistics each month promptly and in detail.

Dull Finishes

DULL finishes for passenger car bodies seem likely to have a good future, despite some present difficulties in selling them to the public.

A well known varnish manufacturer who makes both glossy and dull finishes and who should, therefore, be unprejudiced, told us recently that the average automobile buyer is just one stage removed from the magpie which is given to picking out shiny in preference to dull objects and that such buyer will continue to favor, in the future as he has done in the past, cars with glossy finish.

To support this conclusion he called attention to certain facts which indicate that even the few car makers who have featured a dull finish are beginning to show signs of abandoning it in favor of the glossy type. He stated further that a certain New York maker of custom bodies who long has favored and pushed the dull finish job never has succeeded in selling it to more than 20 per cent of his customers, although they are presumed to be discriminating purchasers of much better than average taste.

This same varnish maker is planning to announce shortly a new pyroxylin finish which does not yield the same depth of lustre given by a transparent varnish, even though the surface be polished to the best advantage.

With these points in mind, we have talked to other makers of pyroxylin finishes and they admit that these

finishes have to be "sold" to car purchasers accustomed to the more lustrous type of finish, but they add that the excellent wearing qualities of the nitro-cellulose product are a convincing and sufficient sales argument. They point out also that there was a time when much furniture and practically all pianos were supposed to require a high polish in order to sell readily, whereas today it is difficult to sell furniture with a high polish except in the cheapest grades.

In short, styles and probably tastes have changed.

This was not brought about without sales effort, however, and a similar change in respect to car finishes will not be likely to occur without corresponding efforts on the part of those interested in marketing the dull or semi-gloss type. All effective means of promoting the sale of such products are likely to be needed.

Another point which should not be overlooked, however, is that the owner of a car which once was shiny, but has become dull after a reasonable length of service, in some cases will be more inclined to purchase a new car for appearance sake, than he might if his own dulled car came near to matching a new dull finish car. On the other hand, if a car which is dull finished in the first place changes less in appearance after a number of years of use, as it probably will, the wise owner will not be slow to appreciate such an advantage.

Tire Inventories

TIRE dealers and the tire manufacturers both have begun to collect information concerning tires stocks in the hands of dealers with a view to stabilizing the business through better adjustment of production and inventories. The first returns showed conflicting reports. The compilations didn't agree.

There is nothing particularly discouraging in this fact, however, as the effort to gather accurate retail statistics is almost certain to involve a good many difficulties. Without going into the details of the statement issued subsequently by the National Tire Dealers' Association asking for better definition of a tire dealer, it is evident that the tire industry as a whole is on the right track. The last paragraph of the dealer statement sums up the situation well when it says that "if the manufacturers of tires and tubes know what dealers actually are carrying, they will be in a better way to govern their production."

The manufacturers know this and are making a sincere effort to get the necessary information on which to base their calculations.

Dealer Discounts

CAR dealers always have had a general idea that they needed longer discounts. It is natural that the retailers should desire wider margins on which to operate, but manufacturers in general have believed that better merchandising and application of sound business principles are needed more than greater discounts. Despite that general attitude, however, discounts are higher today than they were a few years ago, although the trend upward has been very gradual.

Dealer discounts have been boosted in one case recently. In some ways this is a natural result of a period of very keen competition for business and a general decline in retail sales. It is not a cure-all for dealer profit ills, however. Too often increased discounts mean only greater trade-in allowances, in which case neither the dealers nor the manufacturers benefit. Whatever may be the discount, it must be regarded by the retailer as a source of profits—not as an additional salesman on his force.

More Leaders in Industry Pay Tribute to H. M. Swetland

TELEGRAMS and letters expressing the affection and respect with which H. M. Swetland was regarded by men in the industry have continued to arrive. In them all there is universal tribute to the man who was so great a constructive force in building, not only business publications, but the industry itself. The messages below were received just after last week's *AUTOMOTIVE INDUSTRIES* went to press.

Howard E. Coffin, former president of the Society of Automotive Engineers, and with whom Mr. Swetland worked very closely in the days when the standardization program of the society was started, wires as follows:

"Mr. Swetland's death causes me sincere grief. For many years and in many undertakings I have found in him a true friend and always a staunch supporter of every movement for the industrial or national good. His loss will be greatly felt both inside and outside the automotive field, and by every man who knew him and loved him."

Christian Girl of the C. G. Spring Co., and who for many years was an intimate friend of Mr. Swetland's, pays him the following tribute:

"I am deeply shocked at the passing of Mr. Swetland. A pioneer guide, friend and defender has been lost to our industry. A giant oak has fallen."

Howard C. Marmon, vice-president, Nordyke & Marmon, and former president of the Society of Automotive Engineers, wires:

"I am deeply sorry to learn that Mr. Swetland is dead. I have always enjoyed my association with him very much."

A memorial pamphlet issued by the National Publishers Association says:

"His wisdom, foresight and leadership were responsible in a large measure for the success of the National Publishers Association, which comprises the largest organization of magazine publishers in the world and includes every class of periodical known to the American public."

Output Centers See Better July

Producers Expect That by First of Month Stocks of Automobiles Will Be So Depleted as to Warrant Heavier Operations

NEW YORK, June 23—The automotive industry is experiencing the lull common to this season of the year, with little probability that it will increase schedules to any extent before the middle of next month at the earliest. The midsummer let-down is affording many manufacturers an opportunity to put their plants in shape for the resumption of heavy operations on new models, some of which have already appeared.

With general business reported fundamentally sound, it is felt that the industry will continue to follow a wholesome trend and keep on a level with sales and production in other lines of activity. There is no reason to believe that the relative position it has held for months will be lost now. Conditions within the industry itself are good, with inventories low and a general disposition to keep intact all forces in the operating organization pending a pick-up in schedules, or the reopening of such factories as have closed or will close for the usual vacation and overhauling period.

Busy Moving Stocks

Automobile dealers are concentrating their efforts on moving stocks and not increasing them, and report that with the improvement in the weather there has been a fairly strong forward movement in sales. In some cities the number of cars sold thus far in June is well ahead of last month, although not on a par with the record of June a year ago, which was phenomenal. More summer-like weather has brought back into popularity the open model of car for which up to this time this year the demand has been below normal.

By July 1 it is believed that stocks will be so far depleted as to warrant more extensive operations on the part of producers. Prospects are held out for a fair volume of business in July and August, normally slow months.

Tire sales have increased under the impetus of reduced prices or the equivalent, and inventories of the finished product both in the hands of manufacturers and dealers should show a marked decline this month. Production in tire-producing centers is reported at a low point at the present time.

Parts Activity Light

The parts branch of the industry continues to follow the pace set by car manufacturers, and its activity next month will depend upon the operations in the car-producing field. All branches

of the industry, doubtless, will feel a stimulus with the conventions of the principal political parties out of the way and the atmosphere somewhat clarified because of it.

Chicago Increasing Purchases of Steel

Automobile Manufacturers Expect Good Summer—Horizon Brightens

CHICAGO, June 23—The sudden descent of summer has had the effect of bolstering up the spirits of business factors of this section despite the fact that the influence of warm weather on the movement of commodities has not yet had a chance to assert itself. Hot weather came unannounced to the accompaniment of violent storms which not only made rural travel more difficult and gave many farmers something serious to think about at home, but also caused considerable property damage.

As a consequence, country patronage of retail establishments fell off in the past week rather than taking on the increase that might have been expected under altered circumstances. At the same time knowledge that the backward season very likely has made its final exit and that normal weather will continue from now on has done much toward stimulating the optimism of those engaged in automotive pursuits.

A reduction in the farmer's buying power and in that of the working man who normally earns good wages, but who now in many instances is not on a payroll, has emphasized the importance of these elements to automobile consumption. Factory reports that the laboring class has slipped in its absorption of passenger cars is a

logical result of the curtailment in employment.

The pick-up in many localities in the sale of parts and accessories to farmers suggests that the farmer is going to make his old car do a while longer if he can. He is not expected to come back into the market as a large buyer of new automobiles until things come more his way financially. The wage earner who has been laid off by the factory cannot be expected to buy automobiles until he is restored to the payroll.

General Industrial Conditions

The industrial horizon of this section, however, presents just now more bright spots than it did some days ago. The advance in prices of corn and wheat have contributed to the stimulation of good feeling. There is a freer movement of structural steel and it is believed that the decline in steel production has about run its course. Automobile manufacturers are taking more than two-thirds of their normal steel absorption and some of them have increased their orders. Bank deposits have increased a little, while money is in good supply and easy, with plenty of capital available for legitimate expansions if industry should take a sudden movement forward.

Detroit Makes Ready to Build New Models

Some Producers Offer Special Price Concessions to Close Out Old Stocks

DETROIT, June 23—The closing weeks of June have to an extent become a race in a certain group of factories, a race to clear out and sell all cars of present models at the factories and in dealers' hands. The closing out of the old lines will be immediately followed by the introduction of new models. Important tactical sales advantages are expected to accrue to the factories getting their new lines on display first.

Special sales concessions have been passed on to dealers by these factories, concessions which may be used in any way the dealer sees fit to apply them for the speeding out of the old cars. As a result of these special inducements to buyers it is regarded as assured by these factories that their

dealers will be cleared out of old stock quickly and will be ready to start receiving shipments of new models in July.

The introduction of price concessions to clear out old models quickly, while not exactly new, is being used more generally this year than ever before and indicates somewhat that the industry is brushing up on its merchandising practice. Some factories have done this before and have earned the regard of their dealer organizations as smart merchandisers. It is practically evident that the day has gone by when a stock of cars may be closed out rapidly on a regular merchandising basis, and factories no longer can let a closing-out movement be dragged along.

From the dealer angle the special concession method of closing out lines is especially satisfactory, not only because it helps him to move the line out quickly, but because it permits him to tell the buyer why special concessions are made. There is no customer ill-will engendered by the buying of a car which in a few days becomes a retired model, if he has been in on the "secret" and has been taken care of in his purchase of the retiring car.

New Models Expected

The effect of new model presentation in the coming month will mean that production in these factories will be resumed, which will have a generally stimulating effect upon the industrial situation in this district. This is especially true, as the companies presenting model changes are among the largest producers and their closing for factory changes incidental to new models has been responsible to a large extent for the general slowing down here.

Deliveries at retail as reported by manufacturers for the first ten days of the month were not as high as had been expected, though reasonably good. As a general rule, manufacturers are of the opinion that stocks will be cleared away by the end of the month, bringing an end to the most persistent difficulty and clearing the way for a sound fall business. This goes for both those who are making special merchandising concessions and those selling on a regular basis and is especially applicable to the large producers.

Industry on Short Time

The entire industry with very few exceptions is working on short time basis, but as a general rule factories are giving at least partial employment to all workers and there is little actual unemployment. In several cases car factories are working on a full week basis. Parts producers are slowed

This Week In the Industry

MEMBERS of the S. A. E. are this week holding their mid-summer meeting at Spring Lake, N. J., discussing four major topics of engineering interest—crankcase-oil dilution, air-cleaners, new developments in transmissions and riding quality. Naturally, the industry looks for this meeting to produce results that will be reflected later on in manufacturing practice.

Advertising managers of automobile manufacturers held their session at Toledo last week, deciding on the keying of advertising, and the adoption of laboratory methods of testing current copy for appeal and sales effect. They also discussed means of cutting the cost of distribution.

The advent of more eight-cylinder models for 1925 can be expected. The first of the new crop are the Jordan Great Line Eight and the Rick-enbacker Vertical Eight, announcements of which were made this week.

That the tire situation is by no means settled is demonstrated by the manner in which other companies have met the Fisk reduction. It would seem as if most of the companies would meet the cut and it also is likely that with this reduction will come the abandonment of the free wheel and rim offer.

Flying from New York to San Francisco between dawn and dusk, a distance of more than 2500 miles in 18½ hours of actual traveling, accomplished by Lieutenant Maughan in a Curtiss is an epoch making feat and at the same time an excellent advertisement for the Government air mail service which starts July 1, with the schedule calling for the transportation of mail from the Atlantic to the Pacific in 34 hours.

down to a greater extent than the car companies owing to the cleaning up on inventories, but as these were light an early return of shipping is expected.

Cleveland Factories Will Take Inventory

Surplus Stocks Reported Cut
To Small Margin — New
Orders Are Coming In

CLEVELAND, June 23—The majority of the automobile manufacturing companies in this district will start the semi-annual inventory period the last of this month or the early part of July, so that actual output for the coming few weeks is expected to be below the average for the year thus far. It is predicted, however, that production for July will show a marked betterment over that of June.

Cleveland producers report that they are in a favorable position regarding inventory and that as soon as this semi-annual job is completed they will go into increased production.

Manufacturers here assert that the real index to the condition of the industry can be based only upon the number and speed of dealer sales to the ultimate consumers. This index, distributors say, indicates a much more healthy condition than it did 60 or even 30 days ago, for dealer stocks are now running low.

With surplus stocks cut down to a small margin, it is said that orders have already shown some increase with Cleveland manufacturers since the real hot weather started the early part of the present week.

Paying Dividends

A healthy sign for the automotive industry in this district is to be found in the fact that two of the more important local companies have already declared the usual stock dividends payable July 1, and that other companies have earned the dividends although they have not as yet been declared.

Both Chandler and Jordan have already declared the dividends payable on the first of the coming month. Stearns and Peerless are expected to take like action at coming meetings of directors. Indications point to other car and truck builders to follow the same course within the next few days.

During the present week there has been a noticeable betterment in the employment situation of the industries allied with automobile manufacturing. Perhaps the most outstanding instance is that of Fisher Body, where a large number of the employees who had been laid off have been called back to work, to care for an increase in body orders.

Output Centers See Better July

Producers Expect That by First of Month Stocks of Automobiles Will Be So Depleted as to Warrant Heavier Operations

NEW YORK, June 23—The automotive industry is experiencing the lull common to this season of the year, with little probability that it will increase schedules to any extent before the middle of next month at the earliest. The midsummer let-down is affording many manufacturers an opportunity to put their plants in shape for the resumption of heavy operations on new models, some of which have already appeared.

With general business reported fundamentally sound, it is felt that the industry will continue to follow a wholesome trend and keep on a level with sales and production in other lines of activity. There is no reason to believe that the relative position it has held for months will be lost now. Conditions within the industry itself are good, with inventories low and a general disposition to keep intact all forces in the operating organization pending a pick-up in schedules, or the reopening of such factories as have closed or will close for the usual vacation and overhauling period.

Busy Moving Stocks

Automobile dealers are concentrating their efforts on moving stocks and not increasing them, and report that with the improvement in the weather there has been a fairly strong forward movement in sales. In some cities the number of cars sold thus far in June is well ahead of last month, although not on a par with the record of June a year ago, which was phenomenal. More summer-like weather has brought back into popularity the open model of car for which up to this time this year the demand has been below normal.

By July 1 it is believed that stocks will be so far depleted as to warrant more extensive operations on the part of producers. Prospects are held out for a fair volume of business in July and August, normally slow months.

Tire sales have increased under the impetus of reduced prices or the equivalent, and inventories of the finished product both in the hands of manufacturers and dealers should show a marked decline this month. Production in tire-producing centers is reported at a low point at the present time.

Parts Activity Light

The parts branch of the industry continues to follow the pace set by car manufacturers, and its activity next month will depend upon the operations in the car-producing field. All branches

of the industry, doubtless, will feel a stimulus with the conventions of the principal political parties out of the way and the atmosphere somewhat clarified because of it.

Chicago Increasing Purchases of Steel

Automobile Manufacturers Expect Good Summer—Horizon Brightens

CHICAGO, June 23—The sudden descent of summer has had the effect of bolstering up the spirits of business factors of this section despite the fact that the influence of warm weather on the movement of commodities has not yet had a chance to assert itself. Hot weather came unannounced to the accompaniment of violent storms which not only made rural travel more difficult and gave many farmers something serious to think about at home, but also caused considerable property damage.

As a consequence, country patronage of retail establishments fell off in the past week rather than taking on the increase that might have been expected under altered circumstances. At the same time knowledge that the backward season very likely has made its final exit and that normal weather will continue from now on has done much toward stimulating the optimism of those engaged in automotive pursuits.

A reduction in the farmer's buying power and in that of the working man who normally earns good wages, but who now in many instances is not on a payroll, has emphasized the importance of these elements to automobile consumption. Factory reports that the laboring class has slipped in its absorption of passenger cars is a

logical result of the curtailment in employment.

The pick-up in many localities in the sale of parts and accessories to farmers suggests that the farmer is going to make his old car do a while longer if he can. He is not expected to come back into the market as a large buyer of new automobiles until things come more his way financially. The wage earner who has been laid off by the factory cannot be expected to buy automobiles until he is restored to the payroll.

General Industrial Conditions

The industrial horizon of this section, however, presents just now more bright spots than it did some days ago. The advance in prices of corn and wheat have contributed to the stimulation of good feeling. There is a freer movement of structural steel and it is believed that the decline in steel production has about run its course. Automobile manufacturers are taking more than two-thirds of their normal steel absorption and some of them have increased their orders. Bank deposits have increased a little, while money is in good supply and easy, with plenty of capital available for legitimate expansions if industry should take a sudden movement forward.

Detroit Makes Ready to Build New Models

Some Producers Offer Special Price Concessions to Close Out Old Stocks

DETROIT, June 23—The closing weeks of June have to an extent become a race in a certain group of factories, a race to clear out and sell all cars of present models at the factories and in dealers' hands. The closing out of the old lines will be immediately followed by the introduction of new models. Important tactical sales advantages are expected to accrue to the factories getting their new lines on display first.

Special sales concessions have been passed on to dealers by these factories, concessions which may be used in any way the dealer sees fit to apply them for the speeding out of the old cars. As a result of these special inducements to buyers it is regarded as assured by these factories that their

dealers will be cleared out of old stock quickly and will be ready to start receiving shipments of new models in July.

The introduction of price concessions to clear out old models quickly, while not exactly new, is being used more generally this year than ever before and indicates somewhat that the industry is brushing up on its merchandising practice. Some factories have done this before and have earned the regard of their dealer organizations as smart merchandisers. It is practically evident that the day has gone by when a stock of cars may be closed out rapidly on a regular merchandising basis, and factories no longer can let a closing-out movement be dragged along.

From the dealer angle the special concession method of closing out lines is especially satisfactory, not only because it helps him to move the line out quickly, but because it permits him to tell the buyer why special concessions are made. There is no customer ill-will engendered by the buying of a car which in a few days becomes a retired model, if he has been in on the "secret" and has been taken care of in his purchase of the retiring car.

New Models Expected

The effect of new model presentation in the coming month will mean that production in these factories will be resumed, which will have a generally stimulating effect upon the industrial situation in this district. This is especially true, as the companies presenting model changes are among the largest producers and their closing for factory changes incidental to new models has been responsible to a large extent for the general slowing down here.

Deliveries at retail as reported by manufacturers for the first ten days of the month were not as high as had been expected, though reasonably good. As a general rule, manufacturers are of the opinion that stocks will be cleared away by the end of the month, bringing an end to the most persistent difficulty and clearing the way for a sound fall business. This goes for both those who are making special merchandising concessions and those selling on a regular basis and is especially applicable to the large producers.

Industry on Short Time

The entire industry with very few exceptions is working on short time basis, but as a general rule factories are giving at least partial employment to all workers and there is little actual unemployment. In several cases car factories are working on a full week basis. Parts producers are slowed

This Week In the Industry

MEMBERS of the S. A. E. are this week holding their mid-summer meeting at Spring Lake, N. J., discussing four major topics of engineering interest—crankcase-oil dilution, air-cleaners, new developments in transmissions and riding quality. Naturally, the industry looks for this meeting to produce results that will be reflected later on in manufacturing practice.

Advertising managers of automobile manufacturers held their session at Toledo last week, deciding on the keying of advertising, and the adoption of laboratory methods of testing current copy for appeal and sales effect. They also discussed means of cutting the cost of distribution.

The advent of more eight-cylinder models for 1925 can be expected. The first of the new crop are the Jordan Great Line Eight and the Rickenbacker Vertical Eight, announcements of which were made this week.

That the tire situation is by no means settled is demonstrated by the manner in which other companies have met the Fisk reduction. It would seem as if most of the companies would meet the cut and it also is likely that with this reduction will come the abandonment of the free wheel and rim offer.

Flying from New York to San Francisco between dawn and dusk, a distance of more than 2500 miles in 18½ hours of actual traveling, accomplished by Lieutenant Maughan in a Curtiss is an epoch making feat and at the same time an excellent advertisement for the Government air mail service which starts July 1, with the schedule calling for the transportation of mail from the the Atlantic to the Pacific in 34 hours.

down to a greater extent than the car companies owing to the cleaning up on inventories, but as these were light an early return of shipping is expected.

Cleveland Factories Will Take Inventory

Surplus Stocks Reported Cut To Small Margin—New Orders Are Coming In

CLEVELAND, June 23—The majority of the automobile manufacturing companies in this district will start the semi-annual inventory period the last of this month or the early part of July, so that actual output for the coming few weeks is expected to be below the average for the year thus far. It is predicted, however, that production for July will show a marked betterment over that of June.

Cleveland producers report that they are in a favorable position regarding inventory and that as soon as this semi-annual job is completed they will go into increased production.

Manufacturers here assert that the real index to the condition of the industry can be based only upon the number and speed of dealer sales to the ultimate consumers. This index, distributors say, indicates a much more healthy condition than it did 60 or even 30 days ago, for dealer stocks are now running low.

With surplus stocks cut down to a small margin, it is said that orders have already shown some increase with Cleveland manufacturers since the real hot weather started the early part of the present week.

Paying Dividends

A healthy sign for the automotive industry in this district is to be found in the fact that two of the more important local companies have already declared the usual stock dividends payable July 1, and that other companies have earned the dividends although they have not as yet been declared.

Both Chandler and Jordan have already declared the dividends payable on the first of the coming month. Stearns and Peerless are expected to take like action at coming meetings of directors. Indications point to other car and truck builders to follow the same course within the next few days.

During the present week there has been a noticeable betterment in the employment situation of the industries allied with automobile manufacturing. Perhaps the most outstanding instance is that of Fisher Body, where a large number of the employees who had been laid off have been called back to work, to care for an increase in body orders.

Tire Prices Reduced to Stimulate Sales

Reductions Range from 2½ to
20 Per Cent in Movement
Inaugurated by Fisk

AKRON, June 25—The cut in automobile tire prices which was inaugurated by the Fisk Rubber Co. and has been followed by most companies, ranging from 2½ to 20 per cent depending upon sizes and kind, will affect the rubber industry less severely than did the reduction made the middle of last year.

When tire prices were slashed in June of 1923 the industry realized that the second half of the year would probably be without profits and the actual statements issued at the end of the year showed these predictions to be correct. At that time it was impossible for the industry to absorb a 15 to 20 per cent reduction without suffering losses.

Cost of Operation Lower

Conditions in the tire industry are radically different this year than they were only a short twelve months ago.

Since last year costs of all kinds have been reduced, and this alone, without any increase in prices during the first half of the year, tended toward one of the most profitable periods in the history of the industry.

Above all is the cut which has been brought about in the merchandising of tires by many of the larger companies. The costly branches, of which one company maintained more than 80 last year at this time, have been reduced until they are almost a thing of the past. The company with 80 branches a year ago has less than 12 at the present time.

The excise tax of 5 per cent has been reduced to one-half of this amount beginning the first of the month. This is a saving of not less than \$12,000,000 to the automobile tire industry.

The cost of raw materials has decreased in some instances more than 30 and 40 per cent since a year ago. A year ago crude rubber was selling at better than 30 cents a pound. At the present time it is selling well under 20 cents a pound.

Fabric Price Down

Automobile tire fabric, which a year ago was selling at above 60 cents a pound in certain grades, has been reduced more than 10 and 12 cents a pound for the same grades.

Factory production costs, which seemed to have reached bottom at the beginning of 1923, dropped further during the subsequent period with the reduction in actual manufacturing costs lowered in many instances at least 5 per cent.

(Continued on page 1408)

FORD DENIES REPORT OF SATURDAY CLOSING

DETROIT, June 20—Reports that the plant or the offices are on a five-day week basis indefinitely are denied by the Ford Motor Co. The closing of the offices on Saturday, June 14, was by no means as general as indicated. Though the clerical force did not work, it is stated by the company that the closings may be repeated, but that a general rule for closing has not been adopted at this time.

No rule has been adopted on the Saturday closing due to the expectancy of the company that business is due to show improvement. Should indications of slow business continue, official action will be taken on Saturday closings.

The report that the Saturday holidays would take the place of regular vacation periods is denied.

De Dion Bouton to Buy Factory of Bellanger

PARIS, June 19 (by mail)—De Dion Bouton this week signed an agreement to purchase the whole of the factory buildings and equipment of the Bellanger Brothers, at Levallois, near Paris, and, it is understood, will make use of these works for the construction of a popular type 8 hp. car, expected to be ready for marketing early in 1925.

The Bellanger company, which assumed considerable proportions during the war, took up automobile construction in 1919, its line comprising both a high-grade four and an eight and, in addition, a low-priced assembly job originated by Benjamin Briscoe, the parts for which came from Detroit.

The high-grade cars were soon withdrawn, but although a persistent effort was made to popularize the low-priced car, it was not successful and finally the accumulated stock was disposed of by making the cars into taxicabs. Of late Bellanger has been specializing on heavy oil engines, tubes and bicycle parts.

Factory Nearly Ready to Build Fokker Plane

NEW YORK, June 23—The Atlantic Aircraft Corp., having leased an option to buy the factory of the former Wittemann Aircraft Corp. at Hasbrouck Heights, N. J., announces that it is about ready to begin the production in this country of the Fokker plane, as designed by Anthony H. G. Fokker.

The chief engineer of the company is A. Francis Arcier, who until recently was engaged in the same capacity with the Wittemann corporation, and who also was in charge of the construction of the giant four-engined bombers built at Belfast, Ireland, during the war.

Toledo Machine Plan Waits Final Action

Stockholders to Meet July 3 to
Give Their Approval to Pro-
posed Reorganization

TOLEDO, June 23—Stockholders of the Toledo Machine & Tool Co. of this city, a large factor in the production of presses and other machine tools for the automotive trade, are to meet at an adjourned meeting on July 3 for the final approval of a reorganization plan for the company.

There are now 53,638 shares of \$50 par common stock outstanding, the company having been organized in 1890 with a capital of \$3,000,000. This common stock will be changed to no par and traded in share for share for a portion of a total issue of 100,000 shares.

In addition, provision will be made for the issuance of an additional \$2,500,000 of 7 per cent cumulative preferred stock. This, together with the 46,362 shares of common which may be marketed following the reorganization of the company, will permit of a considerable expansion in the capital of the company and bring in some new money for extensions of the plants and lines of work.

President Henry Hinde declared that expansion plans were not in definite form now, but that there were many branches of the cold-pressed metal products industry that had scarcely been touched yet.

The company normally employs between 1000 and 1500 men. About three years ago it built a modern foundry at a cost of \$1,000,000 on a new site near Dorr Street and the New York Central lines. Several months ago Harry Collin, local broker, purchased 30,000 shares of the stock in the open market in gaining control for a client. The stock brought \$75 a share. Officers are Henry Hinde, president; E. C. Edwards, vice-president, and Charles W. Greening, secretary-treasurer.

Expect Overland Profits to Be High for 6 Months

TOLEDO, June 23—Bankers here are expecting the semi-annual statement of the Willys-Overland Co. to be one of the best in the history of the company.

The bank indebtedness of about \$4,500,000 will have been eliminated by that time, and substantial profits during the first half of 1924 will be shown despite the lowering of production schedules in the last six weeks.

It is believed by factory officials and bankers here that the low ebb of the present situation has been reached, and from the present on will see a boost in production.

Sales have kept pretty near the average mark of last year, and in some lines Willys-Overland is beginning to face a scarcity of cars for the trade.

British Dunlop Nets Profit of £1,451,792

Covers Period of Eighteen
Months—Plan of Capital Re-
organization Outlined

LONDON, June 16 (by mail)—The long expected report of the Dunlop Rubber Co. for the 18 months ended Dec. 31 last has made its appearance, together with a capital reorganization plan.

The latter aims at putting the company on a sound financial basis by wiping off the deficiency of £11,353,667, which arose from the loss of nearly 7¼ millions sterling in the period ending June, 1922, and from over 4½ millions sterling depreciation in holdings in subsidiaries, American company, etc., during the slump period.

To meet the net deficiency, arrived at after deducting the balance of the reserve fund, it is proposed to write £10,677,543 off the share capital, and to appropriate a portion of the profits shown in the report now issued.

The ordinary shares by this plan will be written down by two-thirds (approximately £10,000,000), the 8 per cent C preference shares by 25 per cent, but with an increase in dividend rights to 10 per cent. Other preference shareholders are asked to surrender contingent rights to participate in surplus profits, and the arrears in preference dividends are to be satisfied by the issue of fully paid ordinary shares.

Bank Debt Discharged

During the period covered by the report, the net profits amounted to £1,451,792, or nearly £1,000,000 per annum which, however, does not take into account the £383,179 deficit of the American company in 1923, for the capital reconstruction will deal with that. The debt to bankers of £2,019,977 shown at June, 1922, has been discharged, and cash, bills and Government securities in hand now amount to more than a million sterling.

The report states that increased efficiency in manufacture has rendered possible the profits now shown in the face of increased competition and low prices, and still greater efficiency is promised. It is stated that the American company's sales are steadily increasing, and that the policy of persevering with this development is showing signs of being justified in the end.

The present board of management is distinct and different from that responsible during the period when the heavy losses of 1921-1922 were incurred.

PLACE OF MEETING CHANGED

CLEVELAND, June 23—The Automotive Electric Association announces that its general meeting will be held at the Greenbrier Hotel, White Sulphur Springs, W. Va., instead of at Eaglesmere Park,

Sound Basis for Resuming Capacity Operations Waits Upon Resumption of Buying by Farmer

AN INTERVIEW WITH J. DALLAS DORT,
President of the Dort Motor Car Co.

By D. M. McDonald,

Detroit News Representative of the Class Journal Company

DETROIT, June 25.

RETURN of a sound basis for general capacity production in the automotive industry cannot reasonably be expected until the farmer gets back in the market, and there is little reason to expect that the farmer will be a buyer until next spring. That is the view of J. Dallas Dort, president of the Dort Motor Car Co.

Buying in the automobile field for the last three years has to a large extent been entirely independent of the farm market, Mr. Dort declares, with the result that the markets which have been taking motor vehicles—the industrial districts of the East, Middle West and the Pacific Coast—are largely sold up and cannot be expected to continue as heavy buyers.

There is no suggestion that the general market for automobiles has been caught up, Mr. Dort says, but there is the conclusion that without the farm market there is too much capacity at present for the available markets. Until the farmer starts buying production will have to be regarded from the viewpoint that the market is limited.

Loss of the farm market is the cause of most of the difficulty in which the industry now finds itself, Mr. Dort declares, and he asserts that there has been no real farm buying for upward of three years. It is true, he says, that farmers have been buying cars, but as a general rule they are not the cars he would buy if he were prosperous. The farmer is a substantial citizen, who likes to have substantial things, but he has been forced to do without them because he has been short of money.

Not until the farmer is able to sell all his products at a good price will he be prosperous, says Mr. Dort, and that means so long as there is an unmarketable surplus he will not be able to get good prices. The return of prosperity to the farmer will be simultaneous with the reopening of European markets for his products, Mr. Dort says, and this to a large extent will be brought about by conclusion of reparations agreements.

Adoption of the Dawes plan has been an important step in the European situation, but it now remains to get it in operation. American financial institutions owe it to the country generally to see that no time is lost in getting the plan under way, Mr. Dort states, and he urges that the larger the extent of American participation the greater will it redound to the country's best interest.

It is reasonable to suppose, he says, that in return for American activity in the restoration program a large marketing opportunity will be created for American agricultural products. It would be illogical that the benefit of reopened markets should go to other countries and indeed, he asserts, it would be illogical if the arrangement for American financing did not provide for the sale of American foodstuffs.

Argument that renewed commercial activity in the European countries will react unfavorably upon American manufactures is fallacious, says Mr. Dort. A study of imports over a period of years reveals that principal items on the list of incoming goods are those which America does not produce, or at least did not produce in large quantities prior to the war, and which those countries are better equipped to produce than we are.

It is entirely reasonable that industries in America may be compelled to compete with foreign made products on the resumption of business abroad. It must be recognized, however, that the opening of these markets to the farmer means far more and is much more important to consider than any possible competition which may be forced upon our industries.

Pa. No change has been made in the dates selected—Sept. 9-11.

District Court Upholds Nachman Spring Patent

DETROIT, June 23—The United States District Court of the Western District of Michigan, Southern Division, has handed down a decision, holding that the D'Arcy Spring Co. of Kalamazoo, Mich., has infringed patent No. 1,411,227, granted to Louis A. Suekoff of the Nachman Spring-Filled Co. of Chicago, under

which the Nachman spring units are manufactured. A writ of injunction has been granted, restraining the D'Arcy company from infringing the patent.

The D'Arcy company announces that the decision has been appealed to the United States Court of Appeals.

"The controversy is over the way we sew the burlap, that is, place the springs in a burlap square or pocket," an officer of the D'Arcy company stated. "A similar case was started against us by another concern three years ago, but we won in the lower court and also in the United States Court of Appeals."

Battery Makers Plan Strong Organization

At Meeting in Cedar Point, Ohio,
They Decide Upon Employing
a Commissioner

Specific Objectives

Specific objectives which would be of immediate benefit to battery manufacturers were adopted at a meeting of the National Battery Manufacturers Association at its meeting at Cedar Point, Ohio, as follows:

1. To tell the truth in advertising, and to place no copy with those publications which carry unsound advertising.
2. To discontinue soliciting business on a consignment basis to new accounts.
3. To adopt the standard terms of 2 per cent 10 days or 30 days net, where satisfactory credit relations have been established.
4. To remove the tariff on lead, and to enact legislation for the prevention of price manipulation.
5. To work with the other automotive associations in effecting the repeal of tax on batteries.
6. To urge the reclassification of batteries and parts for the purpose of reducing freight rates.
7. To cooperate and frankly give correct credit information to fellow members when requested.
8. To collect and distribute data of general interest to all members.
9. To exert combined pressure on the manufacturers of material entering into making of storage batteries, in respect to their selling to the service station at wholesale or manufacturers' prices.

CEDAR POINT, OHIO, June 21—Members of the National Battery Manufacturers Association in their first meeting here yesterday following their organization last March decided to effect immediately a strong association to do constructive work, provided for the employment of commissioner or secretary and adopted a creed.

At this meeting also representatives of battery concerns, parts makers and allied lines took their stand for truth in advertising, guarantees that mean something and assistance to dealers. They also adopted a set of objectives which they hope will clarify the battery business and help make it a better business from the standpoint of manufacturer, dealer and car owner.

L. B. Shinn, special representative of the National Vigilance Committee of the Associated Advertising Clubs of the World, spoke on the work being done to eliminate advertising that is wrong either through carelessness or design.

A creed was adopted as follows:

- A. To promote an enlarged and better acquaintance and more friendly intercourse

among the members, who will, in all reasonable, lawful and proper ways work collectively and individually toward promoting the best interests of the trade.

B. To discuss subjects of interest and value to the industry in which its members are engaged.

C. To establish and circulate ethical principles of fair dealings and practices for the common good of the industry and the public served thereby.

D. To promote truth in advertising, avoiding all statements which might create public distrust in the industry as a whole.

E. To study the dealer's problems and assist him in solving his merchandising and service problems.

F. To cooperate with and be of assistance to similar and allied associations, always taking an active and united interest in the advancement of the battery art.

Will Assist Dealers

It was also agreed to promote as much as possible the success and prosperity of the battery dealer by recommending:

1. Adopting a CHARGE FOR SERVICE.
2. That he make no allowance for the old battery other than the actual junk value, this allowance to be 5 per cent of the retail price of the new battery, and to be published by the manufacturer in form of an exchange price.
3. A fair and profitable scale of charge for rentals, repairs and recharging.
4. Organizing local battery men's associations.
5. The introduction and enforcement of local ordinances and State laws for the protection of rental batteries.

These methods of producing better business conditions for the dealer, while benefiting him primarily, would, of course, benefit the battery manufacturer by giving him a more reliable outlet for his product.

The resignation of R. B. Crane from his position as first vice-president was read and accepted, and R. D. Mowry, formerly second vice-president, was elected to take his place. Leon Percy of the Cooper Corp. was elected second vice-president in Mr. Mowry's place.

The next meeting was scheduled for Friday and Saturday, Sept. 19 and 20, at Niagara Falls, N. Y.

Brake Lining Makers Hear Warner of S. A. E.

NEW YORK, June 25—John A. C. Warner of the Society of Automotive Engineers, in addressing the members of the Asbestos Brake Lining Association here, discussed the need of a standard specification applicable to all conditions.

At the April conference three associations were invited to act as sponsors, and the work to be divided among the Bureau of Standards, the S. A. E. and the American Automobile Association.

A digest of the various State laws shows that no uniformity of requirements exists, and the Asbestos Brake Lining Association, realizing the need of a standard code, has undertaken its formulation with the cooperation of the organizations named.

Previous to the meeting the administrative committee met and transacted routine business.

Ohio Tire Companies Operating Profitably

Statements of Profits Not Available, But Production Reported on Paying Basis

AKRON, June 25—Many of the better known Ohio companies outside of the Akron district are reported to be operating on a very satisfactory basis, and while profit statements are not available for the first half of the year it is stated that for the most part production is on a paying basis.

The Denman-Myers Cord Tire Co. at Salem is reported to be producing about 300 tires a day with profits very satisfactory. The company follows a selling policy not unlike that of the General Tire & Rubber Co. in Akron.

The Salem Tire & Rubber Co. is reported to be making approximately 300 tires daily at the present time.

The Cooper Rubber Corp. at Findley is producing approximately 800 tires a day, while the Giant Tire & Rubber Co. is reported to approximate the same number.

Triangle Makes 400 Daily

The Triangle Tire & Rubber Co., which took over the former Gordon Tire & Rubber Co. at Canton with the assistance of Canton financial interests, is said to be producing 400 tires a day at the present time with prospects for increasing this ticket. R. W. Kent, formerly with the Republic Rubber Co. at Youngstown, is in charge of operations at this plant.

At East Palestine, the National Tire & Rubber Co. is reported to have a daily production of 1000 a day, while the New Tread Tire & Rubber Co. is operating, according to Akron reports, on a 400 tire a day basis.

At Mansfield, the Mansfield Tire & Rubber Co. is reported with a daily ticket of 2000, while the Victor Rubber Co. at Springfield is operating at better than 800 a day.

The Standard Tire & Rubber Co., operated under the direction of R. J. Firestone at Willoughby, is showing an excellent profit with production at better than 650 tires a day, of which a growing number is of the balloon type. The company started operations on this type a short time ago.

Within the Akron district the smaller companies are also making satisfactory reports.

Seiberling at Capacity

The Seiberling Rubber Co. at Barberton, at the head of which is Frank A. Seiberling, formerly president of the Goodyear Tire & Rubber Co., is reported to be making satisfactory profits on capacity operations. It is stated by company officials that the organization costs have been taken care of and the company will show a satisfactory profit in 1924.

(Continued on page 1408)

Thirty Oil Refiners Sued by Government

Believed That Successful Outcome of Suit Will Mean Lower Gasoline Prices

WASHINGTON, June 25—Announcement that the Government has fired its first big gun in the war on the high price of gasoline will be received with interest by the automotive industry, which is chiefly concerned in the success of the effort of the Department of Justice to break up what it charges is a combination of oil interests which violates the Sherman anti-trust law.

This legal battle started today with the filing of suits against 30 of the country's great oil companies, including the Standards, in the District Court at Chicago under direction of Attorney General Harlan F. Stone on the basis of an investigation conducted by the Federal Trade Commission.

Says They Pooled Patents

In bringing the suits Mr. Stone charges that all of the Standard Oil companies mentioned in the suits have combined to control the production of gasoline by pooling of asserted patent rights in violation of the Sherman Act. In making this charge, the Government has in mind the various "cracking" processes, which are patented and which, it is believed, keep up prices because of alleged control by those holding the patents.

No one in the automotive industry is in a position at the present time to predict as to results of the suit, but as one high in authority said today, the probabilities are that if the Government wins and the alleged combination is broken up prices of both gasoline and oil will be reduced in consequence. The industry feels that prices should be lower because of these very patents.

"Cracking" Process Involved

It is declared that "cracking" is a scientific process which tends to lower production costs in permitting of greater production, while besides this the producers benefit through the sale of by-products, an advantage they did not have in the days of 10-cent gasoline. Consequently, it is felt that prices today should be much lower than they are.

It is in this matter of "cracking" patents that the Government places the most emphasis, the Attorney General declaring that "the primary defendants have pooled a number of patents covering unimportant improvements relating thereto, and are seeking to extort huge sums from the manufacturers of gasoline in the guise of royalty and by means of certain restrictive covenants contained in license agreements to restrain and monopolize the interstate and foreign commerce on so-called 'cracked' gasoline and other commodities produced by the cracking process."

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, June 25—The slackened pace of industry and trade continued last week, although some gain was noted in retail markets as a result of more favorable weather. Improvement has been reported in the buying of pig iron, and some reviews indicate that the decline in production has been halted.

Interest rates continue to decline. Three Federal Reserve banks have adopted a discount rate of 3½ per cent, and six more a rate of 4 per cent.

Car loadings in the week ended June 7 numbered 910,707, comparing with 819,904 in the preceding week (a holiday week) and 1,012,312 in the corresponding period last year. With the exception of grain and grain products, all classes of commodities moved in smaller volume than a year ago.

The production of crude petroleum in the week ended June 14 averaged 1,988,200 barrels a day, as compared with a daily average of 1,983,800 barrels in the week before and 2,131,850 barrels in the corresponding week of 1923. Notwithstanding the seasonal increase in gasoline consumption, the price trends of both gasoline and crude petroleum are distinctly downward.

Business failures reported by Bradstreet's for the week ended June 19 total 409, as against 391 in the preceding week and 313 a year ago.

Bank debits to individual accounts reported by the Federal Reserve Board for the week ended June 18 amounted to \$10,811,000,000, marking an increase of 15.5 per cent over the total for the preceding week and an increase of 4.6 per cent over the corresponding figure for last year.

Fisher's index of wholesale commodity prices stood at 143.4 last week, without change from the week before. Bradstreet's food index was also unchanged at \$3.10, comparing with \$3.18 a year ago.

OVERLAND CHAMPION RENAMED

TOLEDO, June 24—The Overland Champion, brought out in October of last year, has been rechristened the Overland Coupe-Sedan. This body model has practically all of the characteristics of the Willys-Knight model of the same name, and it is stated that the change was made because of this similarity.

Committee Suggests More Balloon Sizes

Three Additions Are Recommended by Tire Section of the Rubber Association

NEW YORK, June 24—Additional balloon tire sizes and markings have been recommended by the Tire Executive Committee of the Rubber Association of America, which met here last week. The recommendations were: 33 x 6.00 (6/21) for 31 x 5 rim; 30 x 4.75 (4.75/21) for 29 x 4 rim; and 31 x 4.40 clincher balloon tire.

The Solid and Pneumatic Sections of the Truck Tire Committee also met and recommended that certain sizes of solid and cushion tires for motor vehicles be eliminated. The recommendation, however, does not affect tractor and industrial truck tire sizes.

Consideration also was given the desirability of revising the Standard Tire Warranty now applicable to solids and cushions, to make it correspond to the new 90-day warranty covering all pneumatic tires, but no final decision was reached.

The committee also discussed the practice of some truck and bus manufacturers in the matter of equipping their product with inadequate pneumatic tires and rims. Educational work among such manufacturers probably will be undertaken.

Willys Says Company's Finances Are Best Ever

TOLEDO, June 25—"Business is fine as far as we are concerned," John N. Willys, president of the Willys-Overland Co., told more than 400 dealers, salesmen, bankers and newspaper men from Ohio and surrounding portion of Kentucky, Indiana and Michigan at the third annual dealers' gathering here this noon.

"We have done a good business so far this year and the statement which will be issued to show our financial condition as of June 30 will greatly surprise the general public," he continued. "We are in the best financial shape ever and will show good results despite general business conditions."

The dealers drove away more than 200 cars this afternoon.

CONTINENTAL CAR WINS SUIT

LOUISVILLE, KY., June 25—Judge Davis Edwards has found for the defendant in the suit of Sam Castleman against the Continental Car Co. for \$39,000 alleged due as a 10 per cent commission on a contract amounting to \$390,000 for 2000 motor truck bodies sold to the Government during the war. The suit has been in litigation six years and Castleman's claim with interest amounted to approximately \$50,000.

Detroit Plays Host to Latin Americans

Leading Figures in Automotive Industry Tender Luncheon to Road Delegation

DETROIT, June 23—Members of the Pan-American Highway Commission, here for several days to inspect roads and road-building in the Detroit district, were tendered a dinner at the Detroit Athletic Club by leading figures in the industry, preliminary to their departure today for Cleveland where they will make observations of roads and road-building also. Leaving Cleveland they will return to New York over Pennsylvania highways concluding in these States their personal investigation tour.

Haynes Speaks at Dinner

Fred J. Haynes, president of Dodge Brothers, Inc., was the principal speaker at the dinner. Commenting upon the significance of the visit of the highway men, Mr. Haynes said he believed the tour will do more to promote friendly relations between the peoples of the two Americas than any other mission. He emphasized the desire of automotive executives to serve neighbor nations unselfishly, declaring it not always concerned with thoughts of financial success.

Responding to Mr. Haynes' address, Señor Julio Fajardo of Colombia said that Latin-America appreciates the cordial reception of its delegates as guests of the highway education board. Colombia and her sister republics have noted the effects of good will and co-operation as practiced in the United States, and, in the matter of highway building at least, have decided to follow her example. Experimental stages in those countries are now about passed, he stated, and preparations are under way to begin highway building as a major program.

Mr. Haynes and Señor Fajardo were introduced by Roy D. Chapin, chairman of the Highway Committee of the National Automobile Chamber of Commerce and a member of the Highway Education Board.

Chapin Tells of Growth of Idea

Mr. Chapin spoke of the earnest desire of the automotive leaders to serve the sister nations of Latin-America and explained the purposes and the functions of the Highway Education Board. Particularly he sketched the growth of the idea of the Pan-American Highway Commission, which is the outgrowth of a conference under the auspices of the Pan American Union at Santiago, Chile, several months ago. The task of bringing the delegates to this country was entrusted to the Highway Education Board by the Pan-American Union, he said. Government cooperation also was recognized.

Men responsible for at least 50 per cent of the automotive production of the world were present to greet the delegates, said Mr. Chapin. Among these he introduced H. M. Jewett, Alvan Macauley, W. E. Metzger, C. D. Hastings, H. H. Rice.

Arriving Saturday, the members of commission spent the first day in highway investigation and inspection. Monday and Tuesday the delegates visited the automobile plants of the city. They were the guests of Henry and Edsel Ford, Monday at a luncheon at the Highland Park plant. On Tuesday they were guests at a luncheon in the General Motors Building at which corporation officials were hosts.

Folberth Patents Upheld by U. S. District Court

CHICAGO, June 23—Judge Wilkerson of the United States District Court in Chicago, in the case of the Folberth Auto Specialty Co. vs. the Apex Electric Manufacturing Co., has sustained and held infringed the Folberth patents. Nos. 1,309,724, 1,405,773, 1,438,229 and re-issue No. 15,502.

The Apex company announces that an appeal will be taken.

In a statement issued following the rendering of the decision, the Folberth company says:

The Folberths are pioneers in the suction type automatic windshield cleaner field and under their patent No. 1,405,773 claim to have protection affording them the exclusive right to manufacture any type of automatic windshield cleaner whose motor is operated by the suction of the intake manifold of the automobile engine.

In this action a cylinder and piston type and a diaphragm type cleaner were each held to be infringements. In a former suit against the Mayo-Skinner Manufacturing Co., the manufacture of a cylinder and piston type and a vane type suction operated cleaner were each held to be encroachments on the rights of the Folberth company.

Road Tests Discussed at Meeting of S. A. E.

SPRING LAKE, N. J., June 26—The Highways Committee of the Society of Automotive Engineers met here yesterday to discuss the tests which are being carried on by the United States Bureau of Public Roads in cooperation with the S. A. E. regarding the relation of the highway to the motor vehicle. The session was preliminary to a conference to be held in Washington next Monday with the officials of the Bureau of Public Roads.

The Washington meeting will consider particularly questions of instrumentation for determining the effect of road shocks on the vehicle and will discuss possibilities for future research along similar lines. A later conference in Washington will include representatives of the Rubber Association. The committee meeting yesterday included B. B. Bachman, chairman; R. S. Beggs, Dr. H. C. Dickinson and S. H. Woods.

Coast-to-Coast Air Service Starts Soon

Government Sets Schedule for Daily Trips That Will Ex- pedite Mail Delivery

WASHINGTON, June 26—With daily, regular and permanent air mail service between the Statue of Liberty and the Golden Gate scheduled for inauguration on July 1, a complete summer schedule and necessary information to patrons desiring to avail themselves of the service were made public this week by Postmaster General New.

Under the schedule, planes will leave New York at 10 a. m. and San Francisco at 6 a. m. each day. The trip westward will take 34 hours and 45 minutes and the trip eastward 32 hours and 5 minutes. It is reminded at the outset that the air mail service will not attempt to set speed records. Safety of the pilots and safe handling of the mails will be the prime requisite.

Postage rates for air mail will be eight cents an ounce or fraction thereof, for each zone or part of zone, in which mail is carried by plane. There are three zones and the maximum cost an ounce the entire route is 24 cents. It is explained that transit mail forwarded to destination by Railway Mail Service will be rated to point carried by Air Mail Service.

Planes to Make Stops

The stops the mail planes will make follow: Bellefonte, Cleveland, Bryan, Chicago, Iowa City, Omaha, North Platte, Cheyenne, Rawlins, Rock Springs, Salt Lake City, Elko and Reno.

It is explained that offices not located on the Air Mail Route may dispatch by rail to connect with it. For example: Philadelphia may dispatch to Los Angeles by rail to New York or Cleveland, thence by air to San Francisco; thence by rail to Los Angeles. Denver may dispatch to Los Angeles or Philadelphia; by rail from Denver to Cheyenne; by air to San Francisco or New York; by train San Francisco to Los Angeles; or New York to Philadelphia.

When the transcontinental air mail service begins operation the thousand-mile lighted airway for night flying will have grown to nearly 1600 miles, stretching out on the east from Chicago to Cleveland and on the west from Cheyenne to Rock Springs, Wyo.

"Fisher Fast Freight" Is Name of New Truck

DETROIT, June 25—The Standard Motor Truck Co. will shortly bring out a new light delivery speed truck. It will be known as the "Fisher Fast Freight," named after the president of the company, Albert Fisher. Deliveries on the new model will commence in the fall.

Favors Taking Car of Reckless Driver

A. J. Brosseau Feels That the Revocation of License Proves of Little Value

WASHINGTON, June 25—Voicing the opinion that revocation of licenses accomplishes little, A. J. Brosseau, president of Mack Trucks, Inc., advocated at the organization meeting of the Committee on Traffic Control here this week both the loss of the license and the loss of the car itself as a penalty for recklessness on the part of automobile drivers. The formation of the committee is part of the movement looking toward a national policy of highway accident prevention.

Wants Enforceable Laws

"We are dealing with fifteen million automobile owners and millions of citizens who are not owners," Mr. Brosseau stated, "and the strategy of applying rules and regulations should be from the point of view of ability to enforce them.

"We must make rules which will be followed and must paint the picture for everybody, or we will not get very far. Proper regulations protect life, limb and property. This protection will serve to increase production, for we can have more vehicles on our streets and move the traffic flow much faster. The problem affects every person in the United States."

The committee is the second technical committee engaged in doing the preliminary work for the conference on street and highway safety. At its meeting it adopted a definite program, completed its organization and will meet again in July to consider reports of various sub-committees.

Those Present at Meeting

Roy F. Britton of St. Louis, president of the Automobile Club of Missouri and chairman of the committee, presided. There were present in addition to Mr. Brosseau and Major Britton:

C. L. Bardo, general manager N. Y., N. H. & H. R. R.; D. Marshal Schroeder, chief deputy commissioner of Motor Vehicles Department of the State of Maryland; Marcus A. Dow, executive secretary Bureau of Public Safety, Police Department, New York City, representing Barron G. Collier; John W. O'Connor, head of the Traffic Division of the Police Department of New York; S. J. Williams, representing L. A. De Blois, president National Safety Council.

W. J. Graves, consulting engineer, Detroit; F. E. Jack, vice-president of the Chicago Motor Club; C. R. Mann, American Council of Education; C. W. Price, Elliott Service Co., New York; H. A. Rowe, chairman Committee on Prevention, American Railways Association, Grade Crossing Committee; N. C. Damon, National Automobile Chamber of Commerce, representing Pyke Johnson. David Van Schaack, V. Y. Aetna Life Insurance Co., Hartford, Conn., and Colonel A. B. Barber, director of the conference.

PEUGEOT GIVES CARS TO PUPILS AS PRIZES

PARIS, June 10 (by mail)—Automobiles, motorcycles and bicycles are to replace some of the gilt-edge red-bound volumes which for years past have rewarded the successful pupils in the elementary and high schools of France. The change has been made possible by the generosity of the Peugeot Company, which has offered the cars to the education department of the French Government.

Secretary of Commerce Hoover was present part of the time and expressed great satisfaction over the progress of the work.

Col. A. B. Barber, who made a detailed statement concerning the organization of the various committees and their functions, called the attention of the committee to the fact that the constantly increasing number of accidents each year, due to the use of the motor vehicle, has resulted in a tendency to rush in with untried, ill-considered measures.

He said:

We are confronted with a problem which has no precedents. These conditions are due to the rapid development of the automobile, and the failure of the public to adjust itself to these new conditions. The streets of our cities are designed for the normal traffic of thirty or forty years ago. We are now trying to treat the great stream of the present day as we treated the creek of that time.

Furthermore, there is a tendency to deal with the subject as a class matter. Motorists and pedestrians are not distinct classes. It was true in the early days that the motorist was a smaller class. Today the motorist is as much of a pedestrian as the pedestrian himself, and the pedestrian is a motorist.

We must get down to fundamental principles. To me it seems that uniformity of control is the most important factor in solving a problem of this kind, whether it be by State or by Federal legislation.

Might Set Up Model Law

Major Britton expressed the opinion that it might be possible to devise Federal regulations setting up a model which the State would be quick to adopt and write into its legislation. He laid great stress on the fact that it is absolutely necessary to get to the driver of the motor vehicle information which must govern his conduct at all times and all places.

Mr. Dow stated that in his opinion there were two essentials in any effort to set up some form of standardized street practice. These are the regulation of the driver and the regulation of the pedestrian. The regulation of the pedestrian presents the more difficult problem. Mr. Dow told the committee that less than 50 per cent of the fatalities in the City of New York occur at crossing intersections.

(Continued on page 1408)

13,760 Sales Made by Canadian Durant

Of These 13,507 Are Reported from Leaside Plant During Its Two Years Operations

TORONTO, ONT., June 25—General Manager R. L. Mulch told stockholders of Durant Motors of Canada, Ltd., at the annual meeting that in the two years the company has been in operation 13,507 were sold from the Leaside plant with a sales value of \$9,652,678. The company imported 253 cars with a sales value of \$420,552 making a total of 13,760 cars with a sales value of \$10,073,230. Mr. Mulch reported also that the company has no bank indebtedness and does not expect to have any.

In his statement, he said:

The parts and service departments have made shipments with a sales value of \$255,767. We have also established throughout Canada dealers and selling agencies for Durant and Star cars to the number of 445, and the number of employees we have on our payroll as of date is 569. The land and buildings which we purchased at Leaside at an original cost of \$300,000 have been increased in value by the erection of new buildings and installing of up-to-date equipment, and allowing for depreciation on same, to a figure of \$1,576,444.

All the construction work in this original plan has been completed and paid for. These buildings have no mortgages or liens against them, and are a clear asset to your company. Cash on hand and in banks at this date totals \$145,158. Your company has never had to borrow money from the banks, and we do not anticipate at the present date that it will be necessary to do so.

While the operations for the year show a slight loss, you have to take into consideration that in the short space of time, two years, we have built up an organization such as we have throughout Canada, and have secured business to the extent as shown by the above figures in the face of keen competition of old, long standing automobile companies.

Reeves' Son Graduates and Weds on Same Day

NEW YORK, June 23—Married on the day he was graduated from the University of Pennsylvania to Miss Mary Chisholm of Yonkers, Clifford Reeves, son of Alfred Reeves, general manager of the National Automobile Chamber of Commerce, starts out in the business world as a member of the staff of the Motor and Accessory Manufacturers Association.

Mr. Reeves finished his collegiate career as president of the senior class of 1150 members and one of the four honor men of the university. He is credited with the highest mark given to any student in research work. Besides being president of the senior class, he also was chairman of the Undergraduate Council, representative of the undergraduate body on the Athletic Council, and served as one of the editors of the *Daily Pennsylvanian*.

Men of the Industry and What They Are Doing

Colin Campbell Joins Durant

Colin Campbell, recently resigned from the Chevrolet Motor Co., of which he was vice-president and sales manager for three years, has rejoined his old chief, W. C. Durant. Announcement is made by Mr. Durant of the election of Mr. Campbell as a vice-president of Durant Motors. Mr. Campbell's duties have not been defined as yet, but because of his Chevrolet records, which includes the merchandising of 242,000 cars in 1922 and 403,000 in 1923, it is expected he will figure prominently in the sales department.

Olds Gets Honorary Degree

R. E. Olds, chairman of the board of Reo Motor Car Co., was given an honorary degree of doctor of science at the annual commencement exercises at Kalamazoo College. Mr. Olds is one of the most widely known of the alumni.

Meishner to Assist Fred Wilson

John Meishner has been chosen to assist Vice-President Fred Wilson in the handling of advertising of the Columbia Motors Co. Mr. Meishner comes from Indianapolis, where he has been engaged recently in wholesale and retail automobile selling. Previous to that he was for two and one-half years with the Chilton Co. of Philadelphia.

Briggs Joins Gotfredson

Claude S. Briggs has resigned from the C. R. Wilson Body Co. to join Benjamin Gotfredson in the American Auto Trimming Co. and the Gotfredson Truck Co. Mr. Briggs is well-known as a pioneer in the automotive field. He had been connected with the Wilson organization for the last six years, having joined it early in the war period to take charge of war production. His work with the Gotfredson companies will be in connection with production.

Patterson with Engineering Works

Clarence L. Patterson has resigned as chief engineer of the Metalwood Manufacturing Co. and has become connected as consulting engineer with the Charles F. Elmer Engineering Works, Chicago. Mr. Patterson for nine years was connected with the Metalwood company, specializing in automotive machine tool design and invention and is now returning to the heavier industrial field.

Craig with General Motors Export

Hugh M. Craig, Janesville, Wis., recently promoted by the Olds Motor Works from southeastern district sales manager at Atlanta, Ga., to the executive staff of the factory sales department at Lansing, Mich., has now been advanced to the staff

CAMP FOR POOR GIVEN BY MR. AND MRS. MILES

BOSTON, June 25.—On Saturday, June 28, Governor Baxter of Maine, with members of his staff, will drop down to Christmas Cove and there officially open a fresh air camp for the poor children of Maine provided through the generosity of Sam Miles, manager of the national automobile shows, and Mrs. Miles.

With a large building accommodating 100 youngsters, with all modern facilities including a swimming pool and set in the midst of a big woodland, the place is ideal for giving children of the cities a good start on the road to health.

The camp will be turned over to Col. A. W. McIntyre of the Salvation Army headquarters of New England who will place it in charge of Ensign and Mrs. Walker of Pawtucket. The Army will select the children from various Maine cities and will ask the Rotary Clubs to aid in the work, especially in affording transportation to and from the camp.

of the General Motors Export Co., with headquarters in New York City. After a time he is to be assigned to some foreign field as a sales manager.

Frank Lord with Campbell

Frank Lord, advertising manager of the Chevrolet Motor Co., has resigned to join Colin Campbell, whose appointment as vice-president of Durant Motors was announced this week. Mr. Lord and Mr. Campbell were closely associated when the latter was general sales manager of the Chevrolet company.

Evans Leaves Moline Plow

The work of Harry F. Evans, for several years foreign trade department manager of the Moline Plow Co., Rock Island, Ill., has been taken over by Hugh N. Johnson, president, and R. M. Lea, vice-president. The change is in line with the new Moline Plow policy of reducing its executive overhead. Mr. Evans returned from a tour of South America recently with orders running into six figures.

Kincaid Elected Vice-President

Russell M. Kincaid has been elected vice-president of the Garford Motor Truck Co. of Lima, Ohio. He has been assistant to the president, Emmet R. Curtin. Previous to his connection with the Garford company he was works manager of the United States Light & Heat Corp. of Niagara Falls.

Jordan to Produce "Great Line Eight"

Eight-Cylinder Model Announced, with Company Continuing to Build the "Six"

CLEVELAND, June 24—The "Great Line Eight" is the 1925 contribution of the Jordan Motor Car Co., which today announced that it is adding an eight-cylinder model to its family. The six-cylinder line will be continued with prices unchanged, but the newcomer is to be its running mate.

The "Great Line Eight" is an entirely new job, new chassis, new engine, and with balloon tires and four-wheel hydraulic brakes as standard equipment. Deliveries will start July 5 and production pushed to meet the anticipated mid-summer demand.

The engine is of the company's own design, built by Continental, and carries cylinders 3 x 4½ in. At 3000 r.p.m. it is said to develop 74 hp. The wheelbase is 125½ in.

Prices of the "Great Line Eight" are as follows: Five-Passenger phaeton, \$2,575; Play Boy roadster, \$2,575; victoria, \$2,775; brougham, \$2,875 and sedan, \$2,975.

Special Sport Roadster at \$885 Built by Olds

LANSING, MICH., June 23—The Olds Motor Works has brought out a special sport roadster listing at \$885. It is finished in weathered bronze green in either Duco or the Oldsmobile colored enamel.

Included in the standard equipment are steel wheels, nicked radiator shell, radiator bar cap and Moto-Meter, spotlight, front and rear twin bar bumpers, two running board step plates, windshield cleaner, rear vision mirror, four body guard rails on deck door, windshield wings, top boot and special top holders.

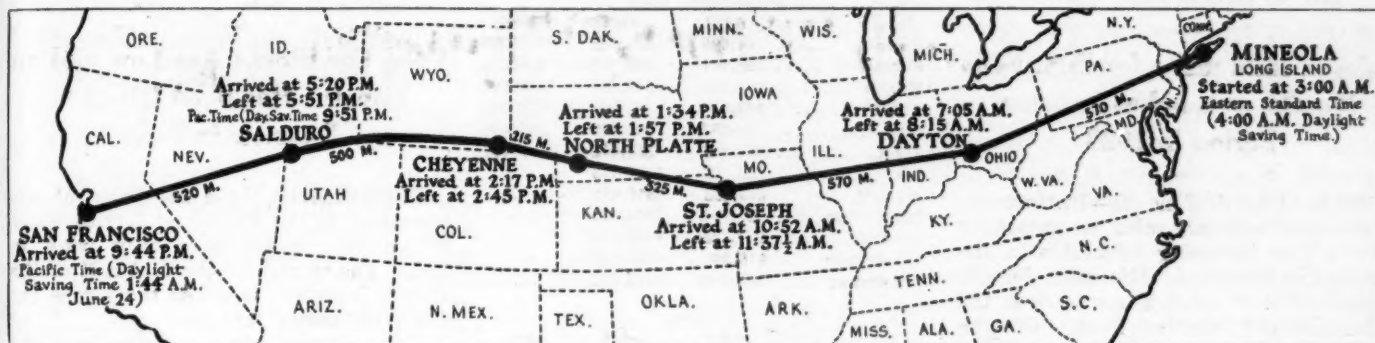
Back of the front seat is an interior carrying space with a capacity of 5 cu. ft. The rear deck space is of nearly 15 cu. ft. capacity.

Clifton Will Entertain Directors of N. A. C. C.

NEW YORK, June 24—Directors of the National Automobile Chamber of Commerce will not hold their July meeting in New York City. Following custom, this session will be in Buffalo, where the directors will be the guests of President Charles Clifton.

It will be a two-day session, July 16-17, with the first day given over to consideration of the renewal of the cross-licensing agreement.

FLIES ACROSS COUNTRY IN 22½ HOURS



Route followed by Lieutenant Maughan in his daylight to dusk flight from the Atlantic to the Pacific, showing refueling stations and times of arrival and departure

Maughan in Curtiss Averages 150 M.P.H. in New Record Hop

NEW YORK, June 24—An American aviator has eaten breakfast in New York City and dined that same night in San Francisco, the feat being made possible through the successful flight of Lieut. Russell Maughan in an Army Curtiss.

In this, his third trial to fly from Coast to Coast between dawn and dusk, Lieutenant Maughan left Mineola Field here at 4.00 daylight time Monday morning and arrived in San Francisco at 9.44 p. m., Pacific Coast time. He was 18½ hours in the air and his total elapsed time was 21½ hours 48½ minutes for the trip which is estimated at 2850 miles. His average speed for the journey is estimated at 150 m.p.h.

The flight was comparatively uneventful in marked comparison with the two sensational attempts made last year by this same flyer. Maughan lost more

than an hour repairing a gasoline feed line but outside of this he experienced no mechanical trouble. The Army flyer, however, suffered from nausea from the continued nervous strain but gamely stuck to his job.

The Curtiss employed on the flight was one of the standard production pursuit ships which are being used extensively by both the Army and Navy services, and is of the single seater tractor biplane type. The only structural change made for this flight was the substituting of extra fuel tanks in place of the military load.

With the increased gasoline supply, the machine's endurance at high speed was increased from the regular limit of 2¾ hours to 4½ hours, the tanks having a capacity of 190 gal. of gasoline and 9 gal. of oil. The maximum speed obtainable with this load was 171 m.p.h. with a landing speed of 71 m.p.h.

A low compression Curtiss D-12, twelve-cylinder water-cooled "vee" engine driving direct a Curtiss-Reed duralumin metal propeller was employed, having a bore and stroke of 4½

in. x 6 in., a compression ratio of 5.31, and a total piston displacement of 1145 cu. in. The engine is rated at 392 hp. at 2000 r.p.m.

The net weight of the engine is 680 lb. Cooling was accomplished by Curtiss wing type radiators fitted to the upper wings only. The gas and oil consumption in lbs. per b.h.p. on this engine was .53 and .015 respectively.

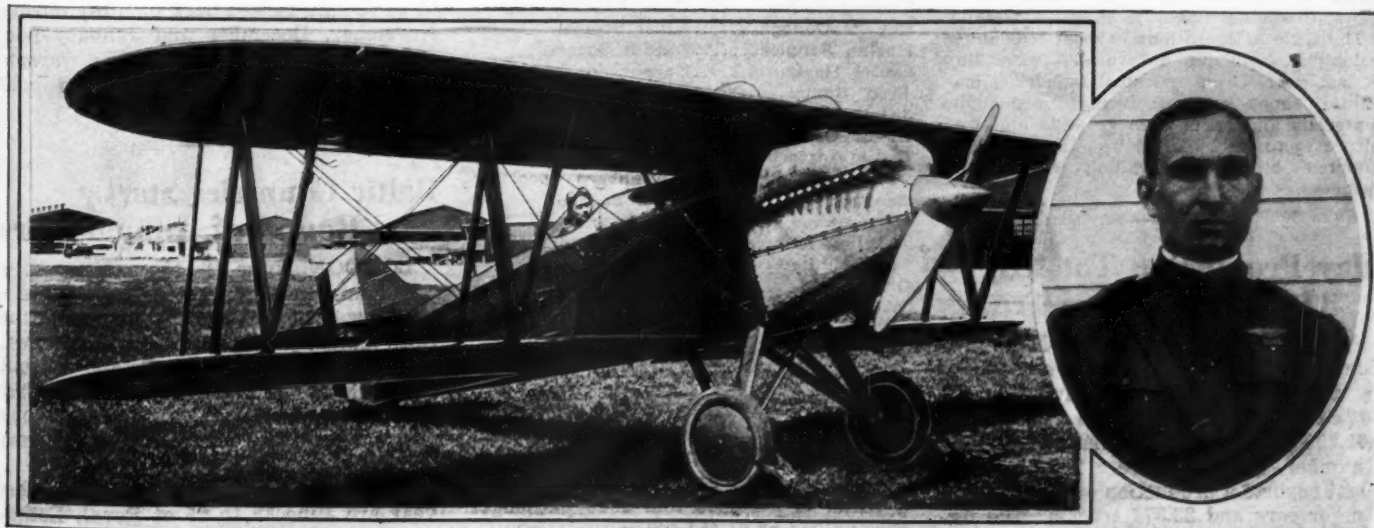
Particulars of Construction

The loadings and weights follow:

Power loading.....	8.58 lbs. per H.P.
Wing loading.....	12.87 lbs. per sq. ft.
Weight empty.....	3300 lbs.
Useful load.....	1300 lbs.
Gross weight.....	4600 lbs.

General characteristics of the machine follow:

Length	23' 1"
Span—Upper	32' 0"
—Lower	32' 0"
Height	9' 1"
Chord—Upper	5' 6"
—Lower	4' 0"
Gap	4' 7½"
Stagger	3' 1"
Incidence	0 deg.



The twelve-cylinder Curtiss plane, piloted by Lieutenant Maughan of the United States Army, which successfully accomplished the flight from New York City to San Francisco at the rate of 150 m.p.h. Inset, Lieut. Russell Maughan, latest aviation hero

SALES SHOW IMPROVEMENT THIS MONTH

Spirit More Hopeful as Business Mounts

Sales in Milwaukee for First Four Months as Good as in Same Period in 1923

MILWAUKEE, June 24—Distinct improvement in retail sales of passenger cars is now becoming noticeable in the Milwaukee territory. The most definite improvement in sales, however, is in the old-established popular lines. On the whole, the spirit among dealers and distributors as well is much more hopeful than it was one and two months ago.

"Business and Financial Comment," monthly business review of local conditions by the largest Milwaukee bank, has the following to say in the current edition:

"Automobile dealers in this territory appear to have sold about as many new cars of all makes in the first four months of 1924 as in the corresponding months of last year, but have considerably more cars on hand than at this time last year. As among the different cars, some have sold much better than last year and some not nearly so well."

The review adds: "Contrary to current opinion, the number of used cars on hand is not as large as last year, which would indicate either that dealers have been more successful in turning their used cars or they have not taken in as many."

Discussing general conditions the summary says:

Employment in 50 typical Milwaukee factories dropped off 6 to 7 per cent during May. The public employment office reports a marked increase in number of applications for work. A large part of those released from factories, however, have been able to secure outdoor work. Because of the activity of building and other outside occupations, common labor is in good demand.

The scale of operations in most Milwaukee industries compares unfavorably with May of last year. Iron and steel foundries, machine shops manufacturing automobile materials and parts, hosiery mills and furniture factories have all been more or less affected by the prevailing dullness in business.

May Production Totaled 312,813 Cars and Trucks

WASHINGTON, June 23—May production of cars and trucks, as figured by the Department of Commerce, was 312,813, compared with the estimate of 301,200 made by the National Automobile Chamber of Commerce. The Government reports a production of 279,439 passenger cars and 33,374 trucks. The figures are based on reports from 205 manufacturers. Twelve small firms did not report in time to be included in the count.

The Department of Commerce report is as follows:

	Passenger Cars		
	1922	1923	1924
January	81,696	223,822	*287,353
February	109,171	254,782	*336,374
March	152,962	319,789	*348,356
April	197,224	344,661	*337,045
May	232,462	350,460	279,439
June	263,053	*337,442	.....
July	225,103	*297,413	.....
August	249,498	*314,431	.....
September	187,711	*298,964	.....
October	217,582	*335,041	.....
November	215,362	*284,939	.....
December	208,016	*275,472	.....

	Trucks		
	1922	1923	1924
January	9,596	19,732	28,922
February	13,360	22,173	31,151
March	20,036	35,284	*34,109
April	22,665	38,085	*36,154
May	24,120	43,730	33,374
June	26,354	41,173	.....
July	22,083	30,692	.....
August	24,711	30,872	.....
September	19,495	28,578	.....
October	21,824	30,139	.....
November	21,967	28,073	.....
December	20,394	27,762	.....

*Revised

17 Cars Entered in Race at Kansas City on July 4

KANSAS CITY, MO., June 25—One race will be held on the Kansas City Speedway this year, the 250-mile national championship, on July 4. The race is being handled by L. J. Smyth, licensee, who was manager.

Keen interest is reported in the territory, and visitors are expected from 12 States. Local motor car distributors are buying blocks of tickets, so that the visiting dealers can be sure of seats. Following are the entries as of June 21, which list is probably final:

Jimmy Murphy.....	Viller Special
Earl Cooper.....	Studebaker Special
Tommy Milton.....	Miller Special
Bob McDonogh.....	Miller Special
Harlan Fengler.....	Durant Special
Harry Hartz.....	Durant Special
Fred Comer.....	Durant Special
Joe Boyer.....	Duesenberg Special
L. L. Corum.....	Duesenberg Special
Ernie Ansterberg.....	Duesenberg Special
Peter DePaolo.....	Duesenberg Special
Bennett Hill.....	Miller Special
Ira Vall.....	Vall Special
Antoine Murre.....	Murre Special
Frank Elliott.....	Miller Special
Ora Halbe.....	Schmidt Special
Wade Morton.....	Miller Special

CANADIAN EXPORTS IN APRIL

WASHINGTON, June 25—Figures received by the Automotive Division of the Department of Commerce place Canadian exports in April at 406 motor trucks of a value of \$139,840 and 2315 passenger cars valued at \$1,451,444.

Detailed American figures will be found on other pages of this issue.

Cleveland District Outstrips May Pace

Used Car Stocks Are Low and an Impetus Has Been Given to Business in Tires

CLEVELAND, June 24—Sales of automobiles in the Cleveland territory are better this month than they were in May. The record for the first half of the month, however, is below the figure for the same period last year.

Sales of used cars are being made at a better rate than are new cars. Some dealers report they have difficulty in maintaining a wide range of prices and models in their stocks. Stocks of used cars are lower than in May.

The weather has been better in June than it was in May, and that has helped considerably. Dealers report that the nearness of the placing of 1925 models on the market has had a retarding influence.

The announcement by all the big tire companies having branches in this city that they would give away wheels and rims with each purchase of five balloon tires has had a stimulating effect on sales of that type of tire. The companies have been selling wheels and rims so that the gift amounts to a reduction of 12 to 15 per cent.

Dealers have passed the concession on to consumers. Balloon tires have caught the fancy of owners in this city, and branch managers report that some sales are being made before the old high pressure tires are worn out.

Automobile finance companies report that purchasers are keeping their payments up, and the dealers are not embarrassed to any extent on account of cars being turned back. One of the big finance companies in the city that had 50 to 60 cars turned back monthly during November, December and January now averages but two a month. The warmer weather influences all owners to hold on to their cars.

Baltic Countries Start Round of Annual Fairs

LONDON, June 16 (by mail)—At a conference held in Riga recently a resolution was passed to the effect that the fairs annually held in Finland, Esthonia, Lithuania, Latvia and Poland should never clash. It was also arranged that exhibits should be transported from one venue to another in order to save time and unnecessary expense.

The dates of the fairs fixed for this year are June 15 to 25 at Reval, Esthonia; July 1 to 6 at Helsingfors, Finland; July 20 to Aug. 3 at Riga, Latvia; Aug. 22 to 30 at Kovno, Lithuania, and Sept. 10 to 17 at Posen, Poland.

BUSINESS GOING AHEAD OF LAST YEAR

Detroit Shows Gain in First 5 Months

More Registrations Reported Despite Falling Off Than Was Evidenced in May

DETROIT, June 24—New cars titled in the State of Michigan for May totaled 20,850, a decrease from a total of 25,941 for the same month last year. Registrations outside of Detroit were 12,243, against a total of 18,233 for the same month last year. For the first five months of this year registrations total 78,938, an increase over the first five months of last year.

New trucks sold throughout the State in May totalled 1624, comparing with 2255 for the same month last year. Total truck deliveries for the first five months of the year are 7245. In Detroit the truck comparison is 682, against 720 for the same month last year.

Ford with total deliveries in the State in May of 10,859 is the only manufacturer to show a gain over the same month last year. Oldsmobile with 364 deliveries shows a gain over 1923, the cars in the two years, however, are in different price classes. Chrysler and Flint, new cars this year, show deliveries of 199 and 118.

Ford percentage of the total deliveries in the State for May was 52 per cent. Last year the percentage was 36. Total low price car deliveries this year was 71 per cent as compared with 63 last year. Cars of the \$1,000 price class and under approximated 84 per cent of sales as against 76 per cent last year. Medium priced cars delivered this year approximated 12 per cent as compared with about 20 per cent in 1923. High priced cars approximated 2 per cent, about the same as last year.

New York

NEW YORK, June 25—Registrations in the New York territory showed a falling off in May as compared with the preceding month, but a gain over May of last year, according to the monthly sales analysis of Sherlock & Arnold. The first five months of this year, however, showed a substantial increase over the corresponding period in 1923 and 1922. For the five months of 1924 registrations of all classes of cars aggregated 42,374, as against 39,776 in 1923 and 30,502 in 1922.

While a gain in registrations has been made in low and medium priced cars every month of this year, as compared with the corresponding month of 1923, only January has gone above last year in the higher priced field.

Recapitulation by months is as follows:

LOW AND MEDIUM PRICED CLASS

	1924	1923
January	3,548	2,803
February	3,814	2,775
March	8,179	8,050
April	12,133	11,050
May	11,597	11,220
Total	39,271	35,898

HIGHER PRICED CLASS

	1924	1923
January	292	212
February	357	606
March	674	821
April	972	1,180
May	808	1,059
Total	3,103	3,878

In the low and medium priced fields, three cars headed the list for May with registrations in excess of 4000. Two others were above 3000 and four others greater than 1000.

Registrations of two makes in the higher priced class exceeded 800 in May and five others went beyond 100.

Lower Priced Car Makers Purchasing More Lumber

ATLANTA, GA., June 25—Lumber manufacturers and jobbers in the Atlanta market advise that the expected improvement in the sales of ash, maple and elm to the automotive and body trades of the North and East have not as yet materialized, and that sales at present continue at a very low ebb, as they have for some weeks.

The trade had been looking for a turn to the better during the early part of June, and still is confident that there will be some betterment before the end of the month.

A few of the largest mills in this district are quickly disposing of their entire cut of ash, maple and elm to the northern trade, but these are principally mills selling to manufacturers of lower priced cars, while those selling to makers of higher priced cars and trucks are reporting comparatively little business.

The price situation is uncertain, due to many smaller mills selling under the market for a quick turnover, but as a whole, ash, maple and elm prices are holding to approximately the same level they have maintained for several months.

The trade here seems certain that demand will attain normalcy again by mid-summer.

ACQUIRES K. & F. ASSETS

KENOSHA, WIS., June 23—The entire assets of the defunct K. & F. Manufacturing Co. have been bid in for \$30,000 by Charles W. Keating, who has already been given possession. The concern manufactured automobile gear locks and a line of equipment specialties, in addition to tools, dies, jigs, etc. The plant has been kept in operation throughout the litigation.

Indiana Makes Gain Beginning 2nd Week

Up to First of Month Retail Business Increased 6 Per Cent Over Previous Year

INDIANAPOLIS, June 24 — Retail sales in Indiana continued to run 6 per cent ahead of last year's boom records up to June 1, according to the latest official registration records.

To the first day of June the new car and truck registration figures for the State were 56,502, which compares with last year's mark of 53,010. Of the total, 4135 were motor trucks. Last year's truck figures were not segregated, so that the passenger car figures alone cannot be exactly compared.

May totals fell off from April, with 11,772 new car sales as against 14,533. At that the month of May, with trucks included, was but 1¼ per cent below May, 1923, so that the drop is not so serious as in States where May runs ahead of April regularly.

June was slow in starting, but lines which have made good records this year have found better business since the tenth of the month. Many dealers have been pushing used car work during recent weeks, and some have tried auctions and other sales efforts. One dealer has been sending representatives and used cars to picnic grounds and amusement parks on Sundays and holidays.

Keep Open Full Week

Almost all local dealers and distributors are "keeping open" seven days and nights of the week. A year ago a movement to close the doors on Sunday worked for a time, but the local dealers' association has not been able to put it over this season.

The city of Indianapolis and other industrial and commercial centers lag behind the smaller towns and cities of the State in sales, and up to the first of the month the rural parts of the State have done much to help the State break former sales records.

19,600 Cars, Million Bicycles in Holland

WASHINGTON, June 25.—The total number of passenger cars in use in Holland is unofficially estimated at 19,600, according to a report to the Department of Commerce from the Commercial Attache's office at The Hague. The number of trucks is 14,000; motorcycles, 31,500, and bicycles, approximately 1,000,000.

About 40 per cent of the automobile tires are imported from France, the United States taking second place.

Favors Taking Cars of Reckless Drivers

A. J. Brosseau Feels That the
Revocation of Licenses Proves
of Little Value

(Continued from page 1403)

He said that only a small proportion of the pedestrians cross the street at points which are not intersections, and that more than 50 per cent of the fatalities are in this class. He feels that pedestrians should be required to cross at crossings provided by the city, and that then much greater responsibility should be placed on the automobile driver at the crossings.

Mr. Jack estimated that the city of Chicago loses in dollars and cents \$60,000,000 a year because of congestion of the streets. One of the methods which have been adopted to relieve this congestion is the widening of 52 miles of streets which will reduce accidents and speed up traffic. Mr. Jack also called attention to the fact that many traffic laws are obsolete, and that what is needed are new laws and greater simplicity.

He then discussed the questions of speed limits, automatic signals, street markings, one way streets, parking, police instructions, schoolboy patrols, illumination, decentralization and street intersections.

Mr. Graves said he believed the sale of automobiles would be stimulated by better safety.

The committee was told by Mr. Williams that in his opinion nothing should be done which would hamper the movement of traffic. "We must work for both safety and speed in traffic," he said. "Hindrances to traffic must be avoided whenever possible."

Four subcommittees were created to make a preliminary study of the various phases of the problem. They are Committees on Licensing of Drivers, City Traffic, Rural Traffic and Legislation. Each of these committees will hold several meetings during the next month and report to the general committee on July 25 at a meeting in Atlantic City.

Committee on City Planning

The Committee on City Planning and Zoning, one of the sub-committees on Secretary Hoover's Conference on Street and Highway Safety, held its first meeting on Tuesday of this week in the conference room of the Department of Commerce. F. A. Delano, chairman, presided.

Those present were Col. A. B. Barber, George B. Ford, Dr. J. M. Gries, John Ihlder, Charles W. Leavitt, Charles Scott, R. H. Whitten, S. J. Williams, W. J. Cox and William Steuart, director of the Census Bureau.

Discussion during the morning session of the committee developed close community of interest between problems and work of this committee and other com-

mittees, such as the committee on traffic control. It was brought out very clearly that while the object of the committee is to contribute to public safety and accident prevention, the means it suggests must, at the same time, facilitate traffic and so guide municipal development that it will take care of rapid expansion of traffic problems through the growth of the number of automobile users.

The city planners' task, it was declared, is to make streets and other public places adequate to meet needs of present and immediate future. Ways and means of doing this will be one of the problems which will be the major consideration of the City Planning and Zoning Committee.

Ohio Tire Companies Operating Profitably

(Continued from page 1400)

The Mohawk Rubber Co., which has wiped out its bank indebtedness during the last eight months, continues operations on a profitable basis. The company has declared another 25-cent a share dividend on its preferred stock as part of the 5¼ per cent accumulated dividends due on this stock. Operations are at better than 700 tires a day.

The Northern Rubber Co. of Barberton, occupying the former Biltwel Rubber Co. plant, announces increasing production. Edmond Shaw, recently resigned from the Firestone Tire & Rubber Co. and for more than 25 years connected with the Akron rubber tire industry, has been named factory manager.

Increases in equipment to take care of greater production is proceeding according to schedule at the Lambert Tire & Rubber Co.

Tire Prices Reduced as a Sales Stimulus

(Continued from page 1398)

With these savings, actual production still high and stocks large, the industry decided that the only manner in which sale of high pressure tires could be stimulated was through a price cut. The reduction, coupled with the sudden turn of the weather, will probably reduce the existing stocks during the remainder of the motoring season to more normal proportions, according to industrial leaders.

Successful Flight Made by Tractor Type Plane

NEW YORK, June 25—The first tractor type amphibian airplane to be built in this country has passed the test for any Army Corps observation machine. Designed and built in the factory of the Loening Aeronautical Corp. of New York, the plane took the air from the landing of the corporation in the East River at the foot of Thirty-first Street, New York.

FINANCIAL NOTES

Gray & Davis, Inc., reports for the first four months net profits after all charges and preferred dividends, of \$47,572, equal to 35 cents a share, against \$50,152 or 36 cents for the entire year of 1923. Cash increased from \$67,131 at the end of 1923 to \$83,856 on April 30 last and the inventory dropped from \$1,762,032 to \$1,653,371 in this four month period.

Hudson Motor Car Co. shows a net income of \$2,699,610 after taxes for the quarter ended May 31. The six months' net income was \$4,000,973, against \$4,446,039, which is equivalent to \$3.03 a share earned on 1,320,050 shares of outstanding stock. For the quarter just ended the stock earnings were \$2.04 a share.

Moon Motor Car Co. has declared the regular quarterly dividend of 75 cents a share. President Stewart McDonald states that production for the first six months was approximately the same as last year and that he expects the last half to show an improvement.

Doehler Die Casting Co. has declared the regular quarterly dividend of 50 cents a share on the common, payable Aug. 1 to stock of record July 15. The company announces it has paid off all bank loans and has \$400,000 cash in bank at the present time.

Wire Wheel Corp. of America, for the year ended Dec. 31, reports total assets of \$4,935,330, current assets of \$1,512,661, current liabilities of \$90,216 and surplus of \$745,114. Included in the assets are cash of \$357,228 and inventories of \$631,250.

Rollin Motors reports net earnings in May of \$43,680 after allowing for reserves of more than \$60,000. In the three months ended May 31 net earnings amounted to \$75,675 after reserves of over \$150,000.

Continental Motors Corp.'s financial statement for the first six months of the fiscal year shows a net profit available for dividends of \$1,163,744, equivalent to \$1.32 a share yearly on the common stock.

India Tire & Rubber Co. has declared an extra dividend of 50 cents a share and the regular quarterly dividend of \$1 a share, payable July 1.

Peerless Truck & Motor Co. has declared the regular quarterly dividend of 50 cents a share, payable June 30 to holders of record June 25.

McQuay-Norris Manufacturing Co. passed the quarterly dividend of 50 cents, believing this act advisable in order to conserve resources.

Hoover Steel Ball Co. has declared a dividend of 2 per cent, payable July 1 to stock of record June 24.

Y. W. C. A. Given \$100,000 in Memory of Mrs. Mott

DETROIT, June 24—Charles S. Mott, vice-president in charge of operations of General Motors Corp., has given \$100,000 to the Young Women's Christian Association of Flint, in memory of his wife, Ethel Harding Mott, who died recently as the result of an accident.

Announcement of the gift was made by H. H. Bassett, president of the Buick Motor Co., who is general chairman of a drive for funds being made by the association. The association proposes to name the dormitory section of the new building in honor of Mrs. Mott.

Britain Subsidizes Merged Air Service

One Company Organized and Will Take Over Interests of Four Operating Concerns

LONDON, June 16 (by mail)—As a result of the negotiations that have been in progress for many months between the British Government and the four aircraft operating companies in England including Handley Page, Daimler, Instone, and the British Marine Air Navigation Co., a new company has been formed, and invitations to the public to subscribe have been issued. The capital of the company is £1,000,000, but the first issue is of 500,000 shares of £1 each at par.

Provisions in Contract

The company will take over the interests of the four aircraft operating concerns already mentioned, and has made a contract with the British Government providing for:

- (1) A subsidy of £1,000,000 spread over ten years, commencing with £137,000 per annum for the first four years, the company being free to accept subsidies in addition from foreign Governments.
- (2) An average minimum mileage of 1,000,000 per annum.
- (3) All aircraft used are to be of British construction.
- (4) All persons employed on British territory to be of British nationality.
- (5) No Government subsidy to be granted to other "heavier than air" air transport for ten years covering the area to be operated by this company.
- (6) The Government to be represented on the board of management by two nominated directors.
- (7) The balance of profits after the payment of 10 per cent dividend on the paid-up capital to be divided as to one-third to the Government for repayment of the subsidy, one-third to reserve for development and one-third for additional dividend to shareholders.

The board of management comprises Sir Eric Geddes as chairman, Frank Searle as managing director, Sir J. G. Beharrell, who is also managing director of the Dunlop Co.; three directors nominated by the old companies, and, as Government representatives, the chairman of Barclays Bank and Major Hills, former financial secretary to the treasury.

Purchase Price Set

The purchase price payable to the four old companies is £148,750, this amount being based upon a report by Brigadier-General Bagnall-Wild and Lieut. Col. M. O'Gorman, who were nominated respectively by the British Air Ministry and Lloyds.

The price will be satisfied by a payment of one-third in cash and two-thirds in fully paid shares in the new company. Nothing is included for goodwill, but the fleets of airplanes and two flying boats, spare engines, plant, etc., are covered.

It is proposed to continue the air services already established between England and France, Belgium, Holland, Germany and the Channel Islands and to effect developments by the establishment of new routes, including others extending farther afield; the idea is ultimately to link up all parts of the British Empire.

The London-Paris service is to be extended to Basle and Zurich, the Swiss Government having agreed to pay a subsidy in return for a regular air service. The London-Cologne service, which is considered to be exceptionally promising, is to be extended to Prague, Vienna, etc., to Constantinople.

The Czechoslovakian Government is also offering a subsidy for a regular service to Prague, and the company anticipates securing this contract. The London-Berlin service will be linked up with Konigsberg and Moscow if suitable arrangements can be made with the various governments concerned.

An estimate of the net divisible profit
(Continued on page 1410)

INDUSTRIAL NOTES

Milwaukee Die & Tool Co., Milwaukee, has changed its corporate title to Advance Tool & Die Casting Co., inasmuch as die casting of aluminum, brass, bronze and other metal is a prominent part of its activities. It will continue making tools, dies, jigs and fixtures for the commercial trade as well as for its own enlarged casting business.

Oilgear Co. of Milwaukee, manufacturer of hydraulic presses, broaching machines, variable delivery pumps and variable speed drives, has purchased a new site for a larger works and let contracts for the construction of the first unit, 100 x 175 ft., 1 story, at 701-705 Park Street. The business has grown so rapidly that the capacity has been doubled twice in three years, and the new shop will represent at least a similar increase over the present works.

Pulitzer Trophy Race to Be Held in October

NEW YORK, June 23—The fifth annual Pulitzer Trophy race will be contested at Dayton, Ohio, Oct. 2, 3 and 4, dates having been definitely set through the issuance of a sanction by the Aeronautical Chamber of Commerce.

The program of the meet also includes the on-to-Dayton race, free-for-all for two-seaters of low horsepower planes, free-for-all for two, three and four seater planes, efficiency race for Aviation Country Club of Detroit trophy, race for light airplanes for Dayton Daily News trophy, observation plane race for the Liberty engine builders' trophy, Dayton Chamber of Commerce trophy race, air mail race for Detroit News trophy and the race for the Brig. Gen. Mitchell trophy.

The purses will total approximately \$50,000, with the Pulitzer Trophy flyers competing for \$9,000 in Liberty bonds.

A feature of the meet will be the flight to Dayton of the Zeppelin airship being built at Friedrichshafen.

METAL MARKETS

So far from presenting any out-of-the-ordinary symptoms, the steel market is running astonishingly true to old-time form. A moderate up-turn in the prices conceded by steel mills for scrap has been among the outstanding developments of the last few days, and this in the past has almost always turned out to be a harbinger of greater activity in the steel industry. Even the absolutely self-contained steel-producing factors, such as the U. S. Steel Corp., which owns and operates its iron ore and coal mines, must look for scrap to the general market for that commodity, and scrap, aside from that produced by the mills themselves, is perhaps the most important raw material entering into steel production.

Several months must elapse between the time that steel mill purchasing agents begin negotiations for the purchase of scrap before these tonnages are actually delivered. The fact, however, that they are willing to buy and at higher prices, and that holders of scrap are holding out for still better prices than those offered, proves that the steel producers are confident of a much broader demand during the year's fourth quarter. The much improved demand for pig iron is another indication pointing toward a slow but normal recovery.

It should be noted, however, that the recent buying of pig iron involved no price advances. It was liquidation pure and simple, virtually on the buyers' own terms. Financial observers are still wedded to old-time notions regarding the influence of the pig iron market and industry on the economic situation as a whole. They still consider the number of furnaces in and out of blast as a most important tell-tale in reading the economic outlook. Time and again in the last decade has the soundness of this view been shaken by actual developments.

For all that, however, much of the artificiality which the war and the aftermath of the war engendered in the pig iron market is giving way to more normal conditions, and the recent buying wave may be interpreted as one of confidence on the part of consumers that at present prices pig iron is an ordinary commercial risk with the probabilities that higher values will result from the very momentum of this buying. Significant it is that sheet-rollers are endeavoring to obtain their third-quarter requirements of sheet bars at \$38, but producers are so far holding firm to the \$40 quotation.

Pig Iron.—There has been some buying by automotive foundries, but the tonnages involved were rather conservative, and there has been nothing of a spectacular nature to these contracts. Prices were what melters considered right, and they covered their demand for a reasonable time ahead.

Aluminum.—Routine conditions are in evidence throughout the market. The movement of metal from Norway has slowed up, and foreign arrivals are chiefly of the odds and ends sort obviously intended for delivery against previously placed orders. What little can be learned regarding the sole domestic producer's backlog of orders, shows that leading automotive consumers are protected by contracts in the usual manner. Considering conditions which in former years would have resulted in heavy supplies in the "outside" market, offerings of resale metal are singularly light.

Copper.—The ingot market continues heavy.

Calendar

SHOWS

Nov. 9-15—New York, Annual Automobile Salon, Commodore Hotel.

Jan. 3-10—New York, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Bronx Armory.

Jan. 24-31—Chicago, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

Jan. 25-31—Chicago, Annual Automobile Salon.

FOREIGN SHOWS

July 1-15—Dunkirk, France, Northern European Fair, Headquarters, No. 2 Rue Gaspard Malo, Dunkirk.

Aug. 3-6—Dantzig, Second International Dantzig Fair, automobiles and allied equipment.

Aug. 23-Sept. 2—Bratislava,

Slovakia, International Danube Fair.

Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.

September—Vienna, Austria, Vienna International Fair.

Sept. 21-28—Prague, Czechoslovakia, Prague Autumn Fair.

Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.

Oct. 17-25—London, Annual Passenger Car Show, Olympia.

Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.

RACES

July 4—Kansas City.

Aug. 3—Lyons, France, European Grand Prix.

Sept. 1—Altoona, Sept. 1—Syracuse.

Sept. 7—Monza Track, near Milan, Italy, Italian Grand Prix.

Oct. 2-4—Dayton, Ohio, Fifth Airplane Race for the Pulitzer Trophy.

Oct. 4—Fresno.

Oct. 19—Kansas City.

Nov. 24—Los Angeles.

CONVENTIONS

Sept. 8-11—White Sulphur Springs, W. Va., Annual Meeting of the Automotive Electric Association, Greenbrier Hotel.

Sept. 19-20—Niagara Falls, N. Y., National Battery Manufacturers Association.

Sept. 22-26—Boston, Sixth Convention and International

Steel Exposition of the American Society for Steel Treating.

Jan. 5—New York, Convention under the auspices of the National Automobile Dealers Association, Hotel Commodore.

Jan. 26-29—Chicago, Eighth Annual Convention of the National Automobile Dealers Association, Hotel LaSalle.

S. A. E. MEETINGS

September—New York City, S. A. E. Automotive Transportation Meeting.

Oct. 21-24—S. A. E. Production Meeting, Detroit.

Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.

Oct. 26—Aeronautical Meeting at Dayton at the time of the Pulitzer Races.

January—S. A. E. Annual Meeting, Detroit.

Britain Subsidizes Merged Air Service

(Continued from page 1409)

for the first year, from all sources, including the government subsidy, is estimated at £53,000, which makes no allowance for development of the services or the reduction in overhead charges which that development should yield. It allows, however, for a normal growth of traffic on the present routes, with the existing plants and facilities.

The estimate of profits has been prepared by Mr. Searle, and is founded upon the auditors' reports of the past working of the four companies to be taken over. It is asserted that an extremely conservative basis has been adopted, which includes a depreciation charge of 33½ per cent on airplanes and from 25 to 33½ per cent on the two classes of engines used.

The whole of the shares now offered for subscription have been underwritten by the British Foreign and Colonial Corp., but in view of the national character of the company this corporation has undertaken the whole of the work of promoting the company and procuring the underwriting of the shares in return for out-of-pocket expenses only.

Flotation of Company Assured

The underwriting commission to be paid by the corporation for the company is 9d per share, while the total promotion expenses are estimated at £22,000. The flotation of the company is assured by the underwriting contracts and it will commence with a working capital of £160,000 after all expenses and the purchase money have been paid.

Some interesting figures are given in the prospectus concerning the development of commercial air transport between England and the Continent of Europe during recent years. Based upon official data it is stated that:

The total number of passengers carried from August, 1919, to December,

1923, was 45,531, of which 33,362 traveled by British craft.

The value of goods imported and exported by air during the same period was £3,180,319, of which £713,020 was transported in 1922 and £776,257 in 1923.

Total cargo carried in 1922 and 1923 amounted to 1283 tons, of which 793 tons were carried in British craft.

Total number of flights was 17,064.

The mileage flown by British aircraft in 1923 engaged in air transport was 943,000 miles, an increase of 226,000 miles over 1922.

It is pointed out that during the period of the British Government subsidy to civic aviation between March, 1921, and March, 1924, not a single passenger's life was lost on any subsidized British service plying between England and the Continent.

45 Cu. In. Sénéchal Wins 24-Hour French Road Race

PARIS, June 19 (by mail)—Driving a 45 cu. in. four cylinder Sénéchal, manufactured by the Chenard-Walcker Co. of Paris, Robert Sénéchal last week won the French 24-hour road race for the Golden Cup by covering a distance of 1058 miles.

The Sénéchal was a tuned up stock car with a four-cylinder overhead valve engine, front wheel brakes and having a very rudimentary type of body, in order to keep weight down. The rules called for the entire distance being covered with one driver, and a mechanic had to be carried. These two men had to do all the work on the car.

Second place was secured by Ivanovsky on a 67 cu. in. E.H.P., his distance being 1004 miles. The smallest two-seater was a 21.7 in. Colombe, which put up 475 miles in the 24 hours. A 31 in. twin-cylinder two-stroke Violet totaled 536 miles, although its driver changed a connecting rod during the race and, owing to overturning, had to drive for six hours with only two spokes in his steering wheel.

Rediscount Rate Cut in Atlanta District

ATLANTA, GA., June 25—The rediscount rate on all classes of paper has been reduced by the Federal Reserve Bank of Atlanta from 4½ to 4 per cent, effective immediately, in the Sixth Reserve District, which comprises the group of southeastern States.

In conservative financial and commercial circles in this district this is taken to indicate that the recent period of business depression and uncertainty has definitely passed, and that there is practical certainty that general business conditions are on the upward turn.

Doubtless one of the most reliable business barometers is the purchasing power of the buying public, and especially so in the South, where so much depends on cotton. It is interesting to note that banks in the district have lately expressed the opinion that the buying power of the South has advanced steadily to a point where it is now collectively as large as it has been in this district in a number of years.

Evidences of improvement are noted in the automotive industry, with sales of new and used cars and commercial trucks having increased steadily the last two or three weeks.

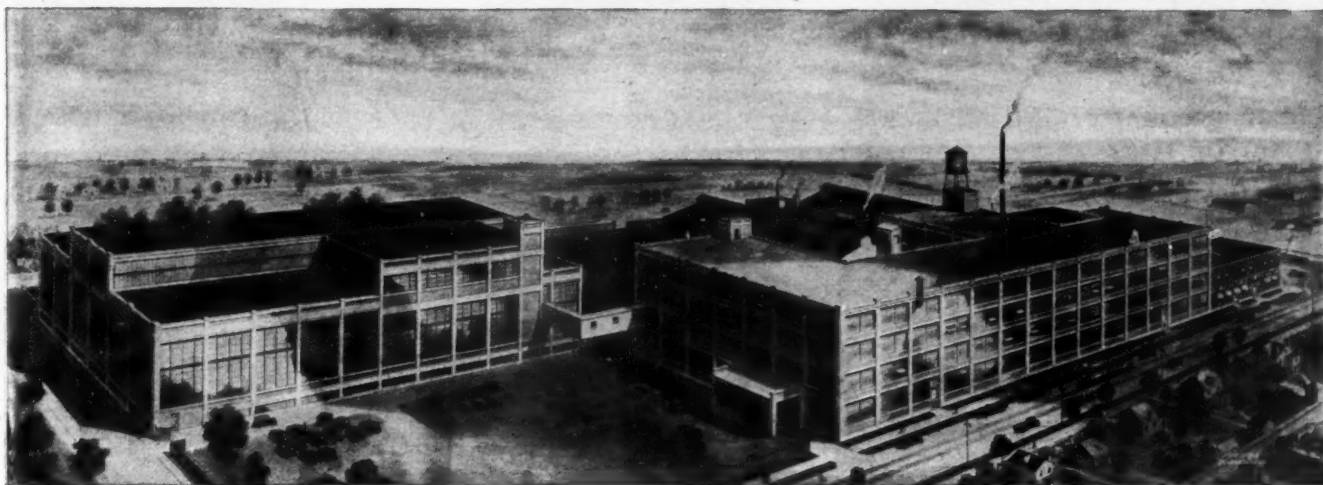
Cotton prices are holding firm around 30 cents a pound and the crop is a large one; other crops also are at satisfactory prices, with good yields in prospect. Business, therefore, appears to be facing a very promising future in this district, with greater optimism prevalent among dealers than in several months.

"MAINTENANCE" NOT "SERVICE"

CONNERSVILLE, IND., June 25—The Lexington Motor Car Co. has decided that hereafter the service and parts department of all Lexington distributors and dealers shall be called the maintenance department, believing that "service" is the most abused term in common business usage.

THE QUALITY IN *QUALITY* Piston Rings

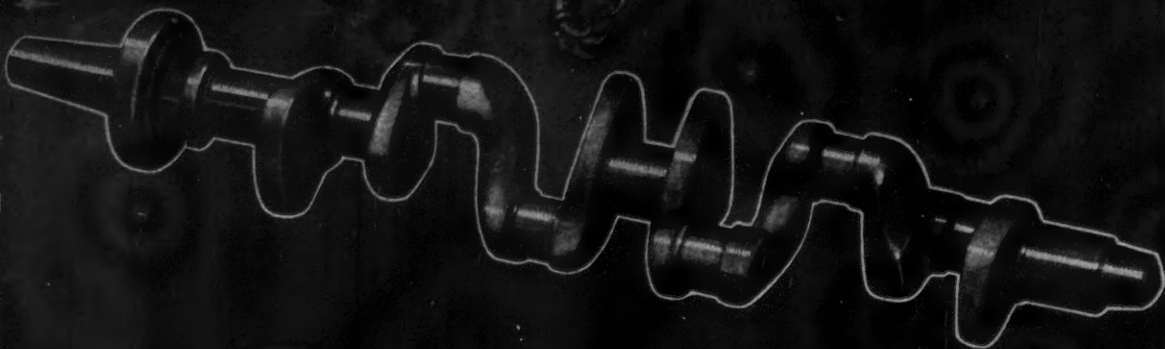
BUILT THIS PLANT



The trade-name *QUALITY* was selected as the only word suitable to fully express the actual values in piston rings that bear this name. And as a mark of identification, and a guarantee of quality, each ring is stamped with the name "QUALITY."

Oversize rings for replacement have, in addition, their oversizes plainly marked on each ring.

The Piston
RING COMPANY
Muskegon, Michigan



The modern crankshaft must possess the attributes of a mighty, unfailing strength and be perfectly constructed to withstand the merciless toll exacted by millions of tireless revolutions.

WYMAN-GORDON
The Crankshaft Makers
Worcester, Mass. Harvey, Ill.

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

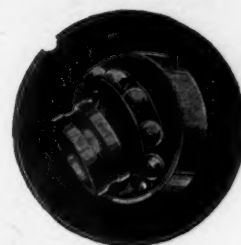
THE CLASS JOURNAL COMPANY
239 WEST 39th STREET NEW YORK CITY

CONTENTS

Reg. U. S. Pat. Off.

Vol. 50 NEW YORK, June 26, 1924 No. 26

<p>Problems Discussed from Owner's Stand-point at S. A. E. Summer Meeting. By Norman G. Shidle</p> <p>Consumption and Dilution of Engine Oil....</p> <p>Handicaps Overcome in Present Oil Rectifier</p> <p>Tests Made for Efficiency of Air Cleaners.</p> <p>New Rickenbacker Vertical Eight Will Supplement the Six. By J. E. Schipper.....</p> <p>Motor Vehicle Development Helps All Industries, Business Leaders Say. By Alvan Macauley</p> <p>Dodge Bros. Used Car Plan Educates Dealers as Well as Public</p> <p>Toledo Advertising Conference Brings Out Merchandising Needs</p> <p>Overhead Valve Engines Predominate at Italian Automobile Show</p> <p>Motor Vehicles Contributed 19.5 Per Cent of the Highway Income in 1923. By Henry R. Trumbower</p> <p>British Firm Introduces Popular Priced 9-Hp. Four</p> <p>Precautions Needed in Production of Automotive Drop Forgings</p> <p>Exports of Cars, Trucks and Tires for April, 1924</p> <p>Editorials</p> <p>News of the Automotive Industry—</p> <p>Output Centers See Better July.....</p> <p>Toledo Machine Plan Waits Final Action....</p> <p>Tire Prices Reduced to Stimulate Sales....</p> <p>British Dunlop Nets Profit of £1,451,792....</p> <p>Sound Basis for Resuming Capacity Operations Waits Upon Resumption of Buying by Farmer</p> <p>Battery Makers Plan Strong Organization....</p> <p>Ohio Tire Companies Operating Profitably....</p> <p>Favors Taking Car of Reckless Driver....</p> <p>13,760 Sales Made by Canadian Durant....</p> <p>Men of the Industry and What They Are Doing</p> <p>Jordan to Produce "Great Line Eight"....</p> <p>Flies Across Country in 22½ Hours.....</p> <p>Sales Show Improvement This Month....</p> <p>Cleveland District Outstrips May Pace....</p> <p>Business Going Ahead of Last Year.....</p> <p>Detroit Shows Gain in First 5 Months....</p> <p>Indiana Makes Gain Beginning 2nd Week....</p> <p>Britain Subsidizes Merged Air Service....</p> <p>Financial Notes</p> <p>Industrial Notes</p> <p>Metal Markets</p> <p>Calendar</p> <p>Broadcaster</p> <p>Index to Advertisers</p>	<p>1361</p> <p>1363</p> <p>1365</p> <p>1367</p> <p>1369</p> <p>1373</p> <p>1376</p> <p>1379</p> <p>1381</p> <p>1382</p> <p>1387</p> <p>1388</p> <p>1392</p> <p>1394</p> <p>1396</p> <p>1398</p> <p>1398</p> <p>1399</p> <p>1399</p> <p>1400</p> <p>1400</p> <p>1403</p> <p>1403</p> <p>1404</p> <p>1404</p> <p>1405</p> <p>1406</p> <p>1406</p> <p>1407</p> <p>1407</p> <p>1407</p> <p>1409</p> <p>1408</p> <p>1409</p> <p>1409</p> <p>1410</p> <p>93</p> <p>94-95</p>
--	--



"NORMA" PRECISION BALL BEARINGS

For Lighting Generators
and
Ignition Apparatus

The worth-while reputations in the automotive world are those of the manufacturers who—in their designing and building and buying—consider the ultimate cost which their customers must pay, as well as their own production costs.

"NORMA" Precision Ball Bearings are today—as they have been for years past—the accepted standards in the magnetos and lighting generators which are distinctive features of cars and trucks of the better class. For the simple reason that—

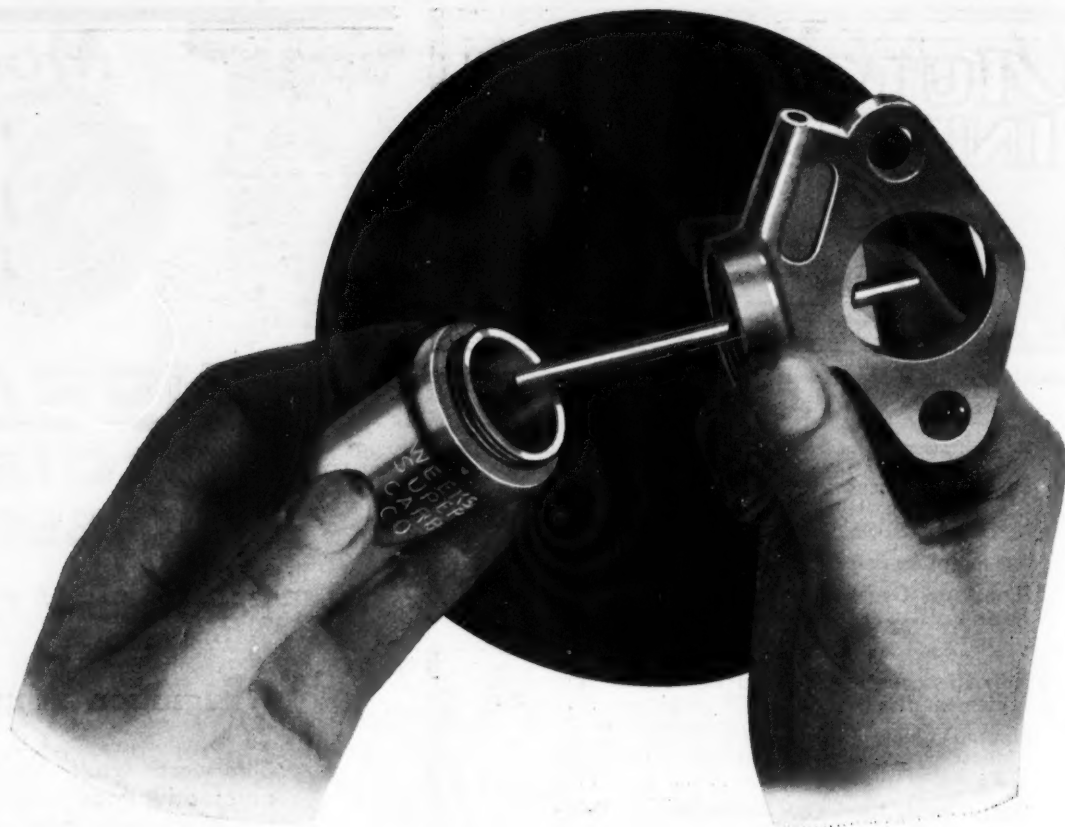
Service records prove that magnetos and lighting generators with "NORMA" Precision Ball Bearings, run more quietly, last longer.

*A booklet will be sent on request.
And our engineers will welcome
an opportunity to work with yours.*

**THE NORMA COMPANY
OF AMERICA**

Anable Avenue
Long Island City New York
BALL, ROLLER AND THRUST BEARINGS





Reducing Sales Resistance at the Source



"Milwaukee" offers an Engineering Service which has never once promised better results from Die Castings without having the finished product fulfill that prediction.

Because the price of a finished product is a very major sales resistance, an increasing number of manufacturers are taking keen interest in our service as the economy and scope of Milwaukee Die Castings are becoming better known.

Typical of the extent to which our products are helping others reduce the sales resistance of price *at its source*, is the device above. The exact advantages gained by the Weeks Super-Carburetor Company through the use of Milwaukee Die Castings are as follows:

1. **Saves Drilling:** Two cap screw channels, air passage into hood of bowl, and brass tubing are cast in.
2. **Saves Milling and Lathe Operations.** Contact surfaces between carburetor and manifold, as well as those between upper body and bowl are cast to perfect smoothness. No gasket required between upper body and bowl to secure the air-tight fit required.
3. **Saves Cutting of Threads.** Both external and internal threads are cast. Embossed lettering on face of bowl never varies in position as it would if threads were cut—always occurring parallel to upper body.
4. **Saves Polishing.** The complete casting presents an exceedingly handsome appearance, reducing polishing time 75%.

Wouldn't it pay you to know if some or all parts of your product are adaptable to die castings? We will gladly cooperate with your engineering department in checking over your product without obligation.

MILWAUKEE DIE CASTING CO.

Dept. L-6, Milwaukee, Wis.

MILWAUKEE BEARINGS and DIE CASTINGS

The NEW Schebler Model "S"



1 Inch
1 $\frac{1}{4}$ Inch
1 $\frac{1}{2}$ Inch

Now! - EXACT Carburetion for Smaller Engines

WE are pleased to announce production of the 1-inch Schebler Model "S" Carburetor.

The Schebler Model "S" Carburetor—"closer to the ideal than any other"—is now available to automobile manufacturers in sizes of 1 inch, 1 $\frac{1}{4}$ inch, and 1 $\frac{1}{2}$ inch, vertical.

EXACT Carburetion develops maximum performance. The exact carburetion furnished by the NEW Schebler Model "S" Carburetor for every engine requirement has been thoroughly verified by several of America's leading automobile manufacturers who, since January 1, 1924, have adopted it as standard equipment.

SCHEBLER

The World's
Finest **CARBURETORS**

THE WHEELER-SCHEBLER CARBURETOR CO., INDIANAPOLIS, U.S.A.



Production Trim That is Attractive and Sales Influencing

Schlegel Broad Lace, Seaming and Pasting
Lace used on door panels, edging and seams
gives the pleasing artistic finish to the in-
terior decoration of fine cars.

The Lace is ornate, in harmony with any
scheme of interior decoration. Only the
finest of dyes are used to give it fast, per-
manent color. It is durable—and practical.

It effects a saving in cloth and in time. It
lies flat and is closely woven so that it will
not pull out over small-head tacks.

This Lace is an aid in production. It is
an aid in selling that carries weight when
the choice of a car hangs in the balance.

We are specialists in the matter of trimmings
and can help you in making a tasteful selection.
We will give you the fine points and the facts.
Simply ask.

THE SCHLEGEL MFG. CO.
ROCHESTER, N. Y.

Broad Laces
Pasting Laces
Seaming Laces
Wind Laces
Curtain Silks
Curtain Tassels
Curtain Cords

SCHLEGEL INTERIOR DECORATION

Hat Racks
Robe Rails
Luggage
Carriers
Arm Rests
Speaking Tubes
Pull-to-handles
Curtain Bands

The Gilliam cage a masterpiece of design!

Axle manufacturers using Gilliam Tapered Roller Bearings include: Adams, Clark, Columbia, Eaton, Flint, Salisbury, Standard Equipment, U S, Vulcan, Wisconsin.



The arrow symbol signifies the recognized ability of Gilliam Tapered Roller Bearings to carry all combinations of radial and thrust loads from all directions. This better bearing performance is due to the tapered roller principle, exclusive features of design and high grade alloy steel construction.

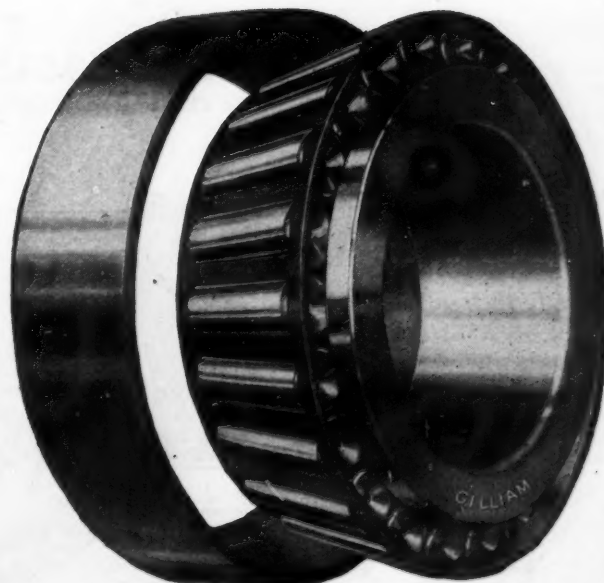
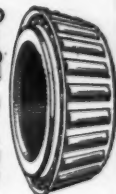
THE outstanding performance of Gilliam Tapered Roller Bearings is made possible by several important features, one of which is the advanced design of the cage.

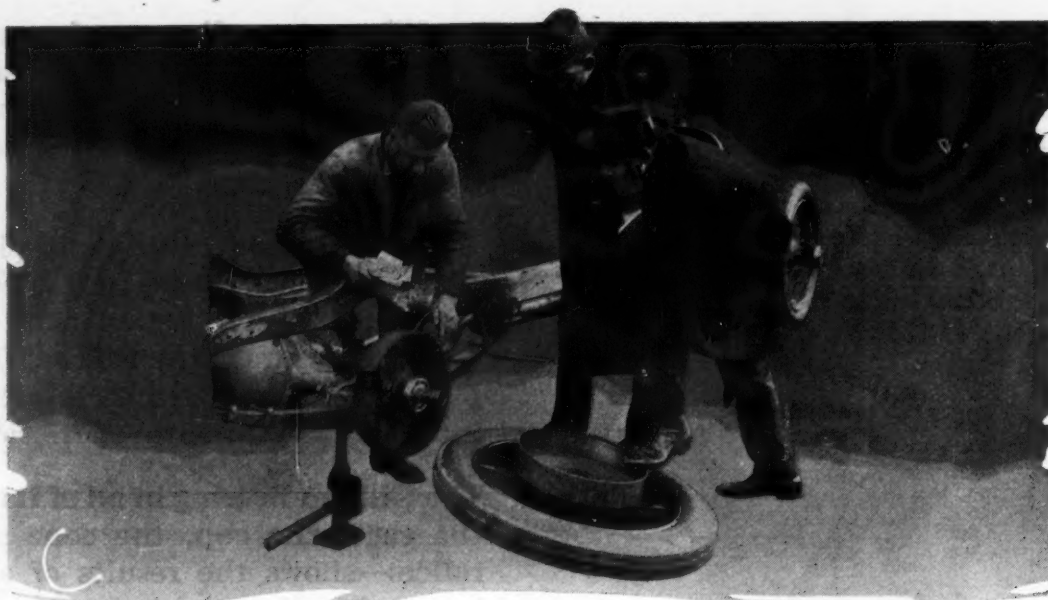
Here you have sturdy simplicity—a clean, smooth, heavy one-piece steel stamping which serves one purpose only—to separate the rollers. Its simple construction permits a free flow of lubricant to all points of friction.

The Gilliam Bearing in all of its parts—the cage, the cup, the cone and the rollers—shows the results of accurate knowledge of anti-friction bearing requirements and skill in manufacturing.

THE GILLIAM MANUFACTURING CO.
Canton Ohio

GILLIAM
TAPERED ROLLER
Bearings





Hess-Bright on Full-Floating Rear Wheels Best for heaviest "Skid Loads"

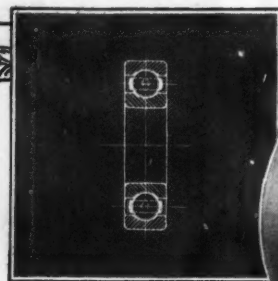
SHOCKS and jolts, the severe end thrust as a result of road action and skidding, all place a heavy burden on rear wheel bearings. Inability to withstand such conditions is clearly indicated when frequent bearing adjustments become necessary.

Hess-Bright Deep-Groove Ball Bearings on rear wheels "stand-up" to all combinations of radial and thrust loads. They operate with a minimum loss of power through friction and wear, require no adjustments and only an occasional application of lubricant.

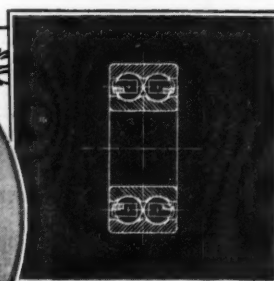
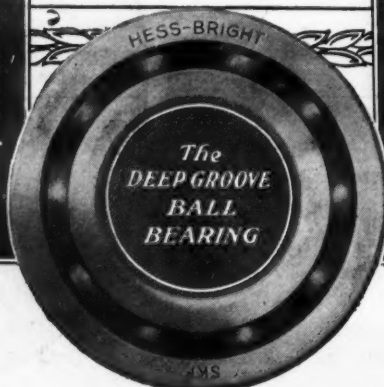
THE HESS-BRIGHT MANUFACTURING COMPANY

Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

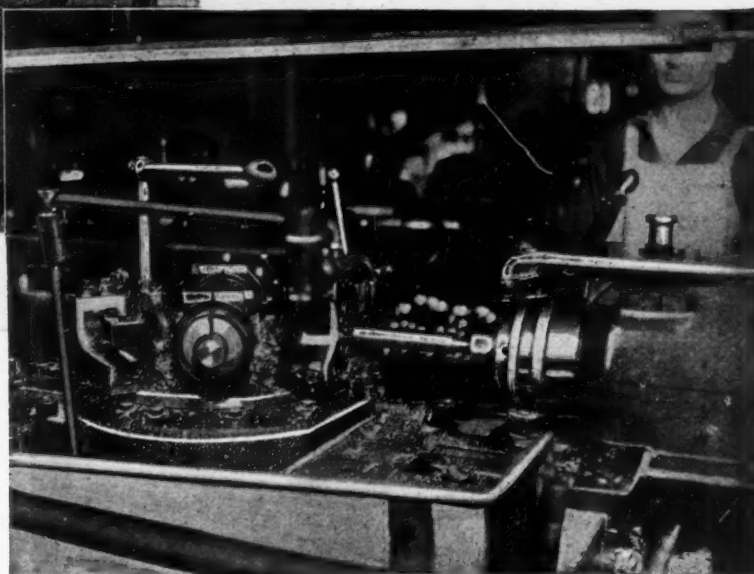
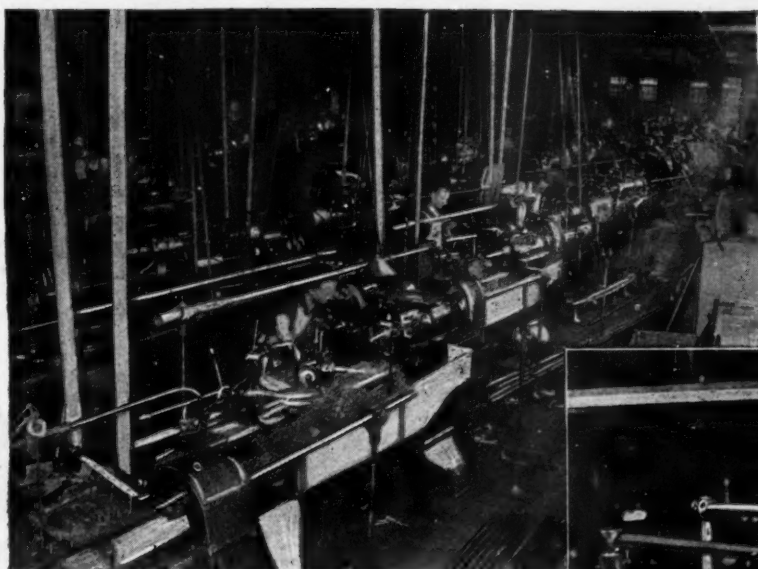
1204



Cross Section of
Single-Row Bearing



Cross Section of
Double-Row Bearing



Every Shop *has its battery* *of FLAT TURRET LATHES* *—Naturally!*

With exceptions, the use of Hartness Flat Turret Lathes is universal. One just naturally EXPECTS to see them. This is true, regardless of the kind of shop or the character of the product.

Despite other hand-operated, semi-automatic and full-automatic machines, the Hartness Lathe has for years more than held its own. The first machine with an automatically-operated turret (1855), it has ever been kept up-to-the-minute.

Today's Flat Turret Lathes are equipped with hardened steel gears in the headstock, multiple disc clutches, ball bearings on all driving shafts, etc., etc.

The new "Steel Head" Series cover at least 90% of the work of the average automotive shop—and can be relied upon to get out the GREATEST PRODUCTION PER DOLLAR INVESTED.

Time estimates gladly furnished—entirely without obligation. "Steel Head" Bulletins are ready.



Diesel Engine Valve, hot-rolled machine steel, body 8" long, finished diameter 1-3/16". Amount of stock removed 1-1/16".

The New "Steel Head" **HARTNESS** FLAT TURRET **LATHE**

JONES & LAMSON MACHINE CO.
SPRINGFIELD, VERMONT

503 Market St., San Francisco, Cal.

9-10 Water Lane, Queen Victoria St., LONDON, Eng.

AGENTS: France, Spain and Belgium—F. Aubert & Co., 182 Rue Lafayette, Paris; Holland—Spilthoff, Beeuwkes & Co., Rotterdam; Japan, Korea, etc.—Mitsui & Co., Ltd., Tokio; Australasia—McPherson's Pty., Ltd., 554 Collins St., Melbourne; Stockholm, Sweden—A. Bel Oscar Lindbom, Postbox 420; Italy—Henry Coe & Clerici, Ramano Lecnicco, Milano (29).



QUIET operation has always been one of the outstanding features of Hyatt Quiet Roller Bearings. And now, in the Hyatt New Series Bearings, this distinctive and highly desirable feature is even more pronounced.

The quiet performance of motors, axles and transmissions equipped with Hyatt New Series Roller Bearings, contributes very materially to the lasting quiet performance of the cars in which they are used.

Manufacturers are better able to meet the requirements of consistent quiet operation through the use of Hyatt Quiet New Series Roller Bearings for supporting shafts and gears.

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
HUNTINGTON, PHILADELPHIA, PITTSBURGH, MINNEAPOLIS
WORCESTER, BUFFALO, CLEVELAND, MILWAUKEE

*The
New Series*

HYATT
Quiet
Roller Bearings



**per-
fect
bal-
ance**

Explains Wisconsin Smoothness

Careful balancing of reciprocating parts, to hair's-weight limits, keeps a Wisconsin Motor smooth-running and quiet long after a "production motor" becomes a rattle-trap.

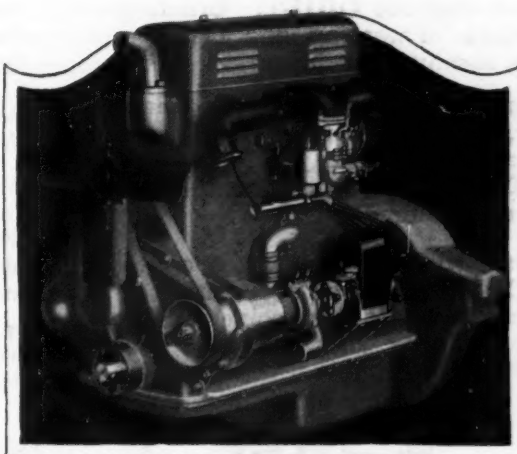
Vibration, which condemns cheap jobs to early junk-heaps, is engineered out of this great motor. The result is long life and amazing performance.

Builders of superior cars and trucks: Our production facilities have been increased. Delivery per schedule guaranteed. Let's exchange specifications.

WISCONSIN MOTOR MFG. CO. MILWAUKEE WISCONSIN

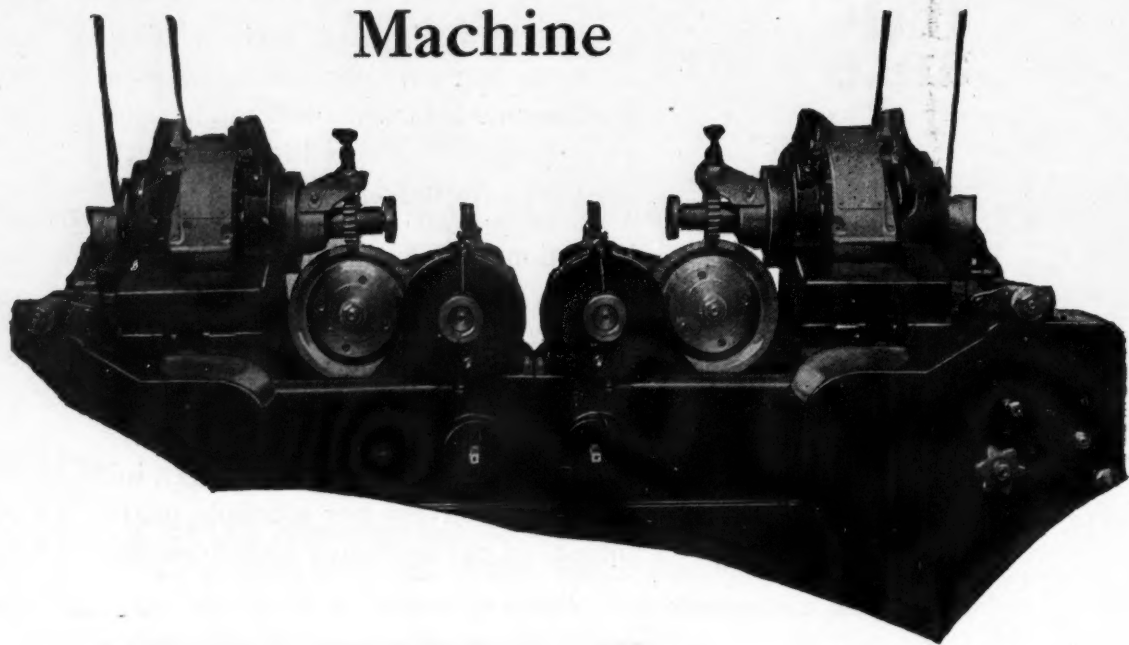
Wisconsin Type "S-U" overhead - valve, 4" x 5" H. P. 30 at 1000, 43 at 1500 and 50 at 2000 R.P.M.

Overall length 36"; weight 590 lbs. Especially adapted to 1 and 1½ ton trucks.



"Gears that are Quiet"

Now the Product
of a SEMI-AUTOMATIC
Machine



Grinding is the one economical method of producing gears that are QUIET. Grinding corrects the effects of warping, and insures a product that is absolutely uniform.

And when handled on the new Fellows Gear-tooth Grinder, Gears that are QUIET cost little more than ordinary gears. This Machine is largely AUTOMATIC in operation. Skilled operators are not required.

There is a wheel-truing device that operates AUTOMATICALLY after each revolution of the work. Once started, the machine continues to operate until the work has made two complete revolutions—when it trips and stops

AUTOMATICALLY. When necessary, the touch of a knob starts the work through a third revolution for a final finishing cut. The "greenest" operator can take a cut as slight as 0.0005" WITH THE COMPLETE ASSURANCE THAT THIS AND NO MORE WILL BE REMOVED.

A Micrometer Setting Gage eliminates the necessity for the operator to set the work to the wheel. Even this is AUTOMATIC and permits any desired amount of stock to be removed from the sides of the gear-teeth.

If we have said anything here to interest you, you are invited to let us put before you additional material on this subject.

THE FELLOWS

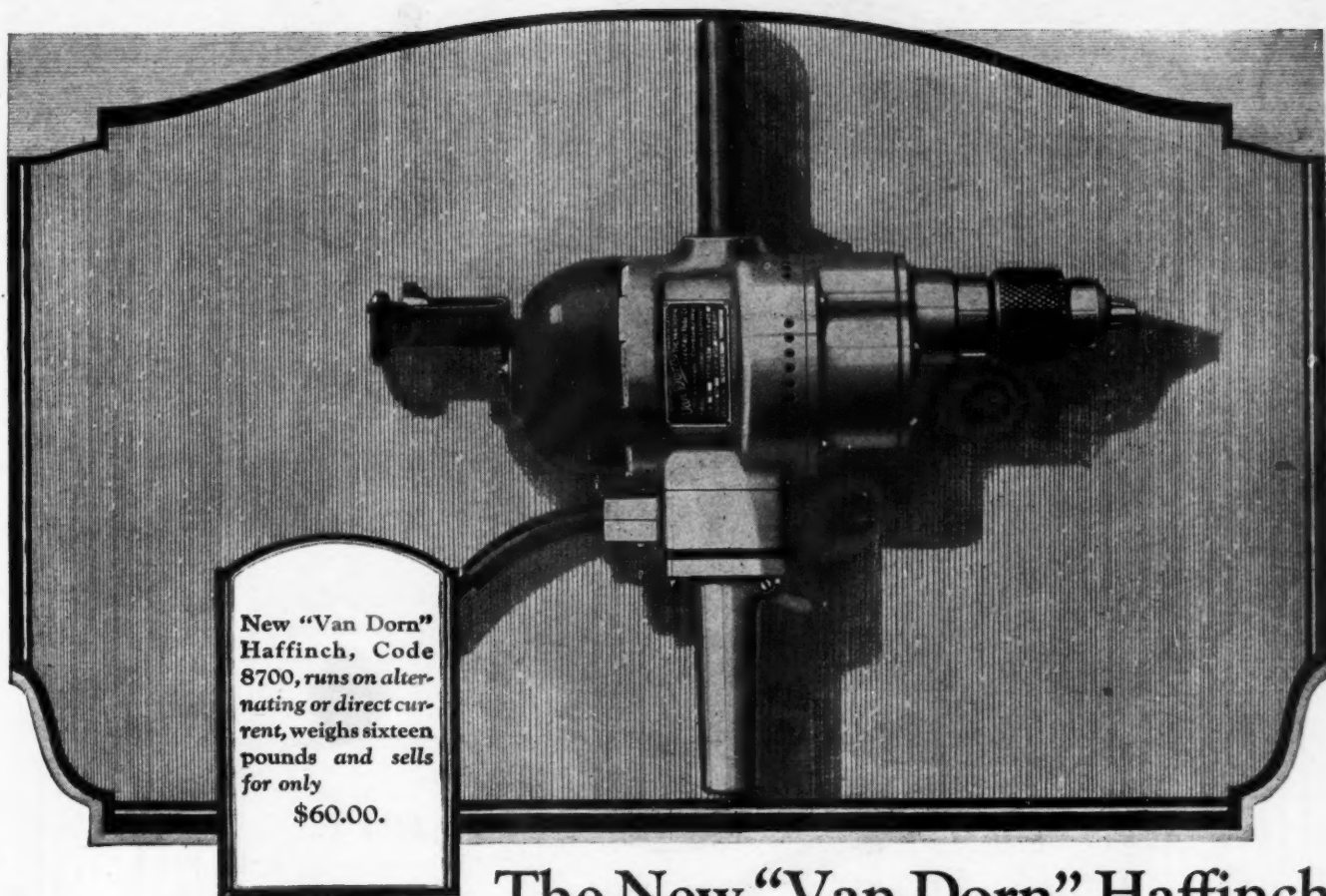
Gear Shaper Company, Springfield, Vermont, U. S. A.

Branch Office: 505 Book Building, Detroit, Mich.

GEAR SHAPERS

GEAR-TOOTH GRINDERS

THREAD GENERATORS



New "Van Dorn"
Haffinch, Code
8700, runs on alter-
nating or direct cur-
rent, weighs sixteen
pounds and sells
for only
\$60.00.

The New "Van Dorn" Haffinch

Has more "pep per pound" than any Electric Drill heretofore produced.

Automobile makers, body builders, accessory manufacturers, garages and service stations will welcome this light weight, reasonable priced, half inch "Van Dorn" Electric Drill that has more power and delivers more holes per man — per tool — per day than any universal electric drill ever offered to this field.

Haffinch is truly a remarkable drill and a worthy addition to America's finest family of Holemakers. It will stand heavy duty or light duty; will drive a drill through toughest steel or softest wood; will work one hour or twenty-four hours on one shift; will drill one hole or a million — and doesn't need a rest every half hour either.

You will find this tool a time saver and a money maker in your plant. A "Van Dorn" representative will welcome an opportunity to demonstrate it to you.



Your Copy of this valuable book is now ready. Everyone interested in more economical hole-making should send for this valuable 60 page educational booklet. Sent free upon request.

The Van Dorn Electric Tool Co.

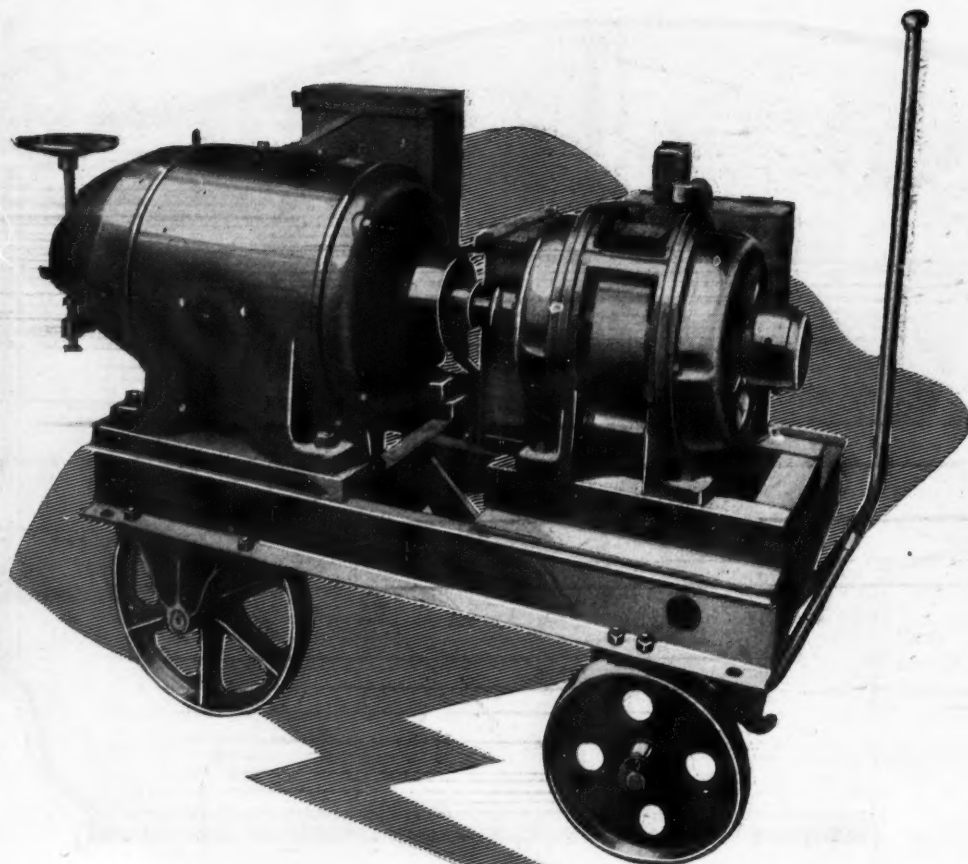
Makers of Portable Electric Drilling, Reaming
and Grinding Machines, etc.

Cleveland, Ohio

"Van Dorn"
**ELECTRIC
DRILLS**

Factory Representatives

*Boston
*Buffalo
*Chattanooga
*Chicago
*Cincinnati
*Denver
*Detroit
*Kansas City
*Los Angeles
*Milwaukee
*Montreal
*New York City
*Philadelphia
*Pittsburgh
*Richmond
*St. Louis
*St. Paul
*San Francisco
*Seattle
*Toronto
*Service



Heavy Duty!

The WD-12 Arc Welder

- operates on any commercial voltage, phase or frequency.
- a two-unit machine (motor and generator).
- generator is self-excited.
- reactor automatically steadies arc.
- hand wheel on generator for regulating welding current.
- any value of welding current between 75 and 300 amperes.
- any commercial sizes of electrodes, large or small.
- supplies power to G-E Automatic Arc Welder for continuous welding.



There is a suitable G-E welder for your every arc welding need. Ask the G-E sales office for complete information.

General Electric Company
Schenectady N. Y.
Sales Offices in All Large Cities

—a feature of the WD-12 Arc Welder

This welder gives 24-hour service, day after day.

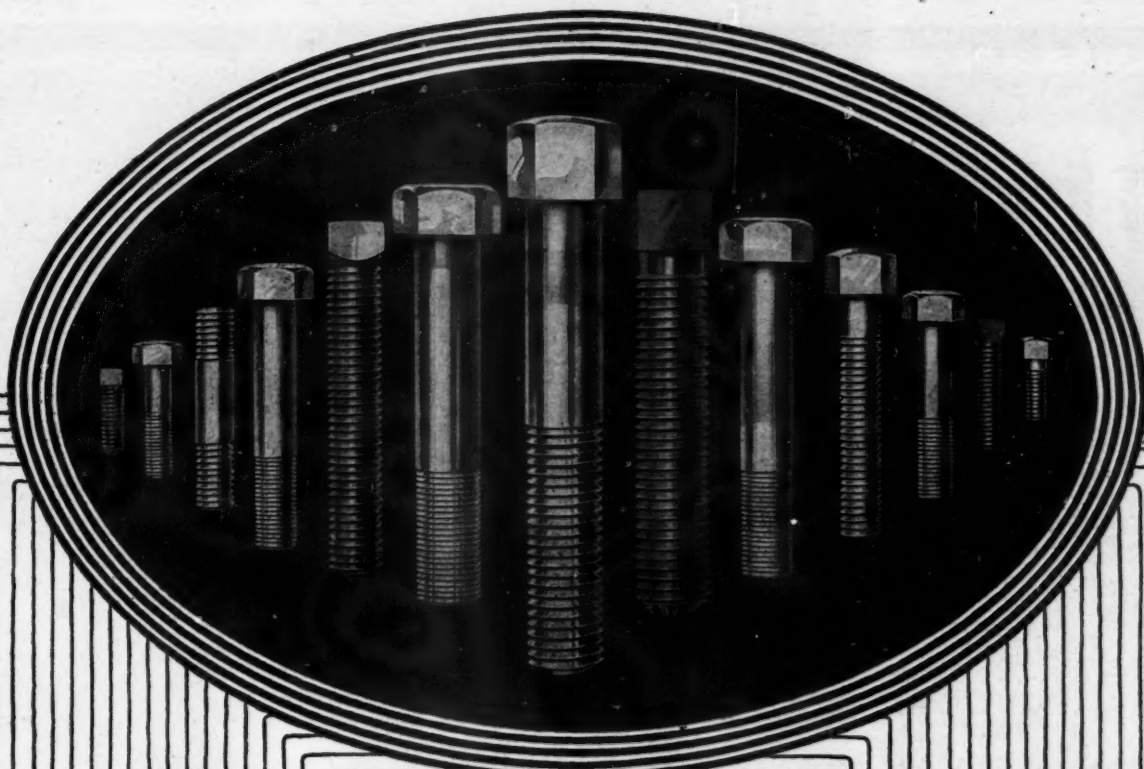
It delivers 200 amperes continuously and 300 amperes for short periods. Voltage can be adjusted to suit the work. High voltage is provided to "burn the metal in" on heavy work.

The WD-12 Arc Welder can be used with all commercial sizes of electrodes up to 1/4" diameter. It will handle any welding job either nearby or over a thousand feet from the machine.

Ready to work when delivered

43B-881

GENERAL ELECTRIC



You Need NAMCO Screws

Because

They Fit snugly—a cut thread tested for accuracy.

They securely grip the surface in which they are screwed—the under side of the head is evenly shaved.

They are sturdy and strong—the threads won't strip nor the head twist off.

They are of uniform accuracy—all will fit with no waste for scrappage.

As a user of screws, don't just these facts mean a considerable saving to you? Just ask for a sample and test them yourself.

Specify NAMCO Screws

We stock for prompt shipments

U. S. S. and S. A. E. Cap Screws, Milled and Upset.

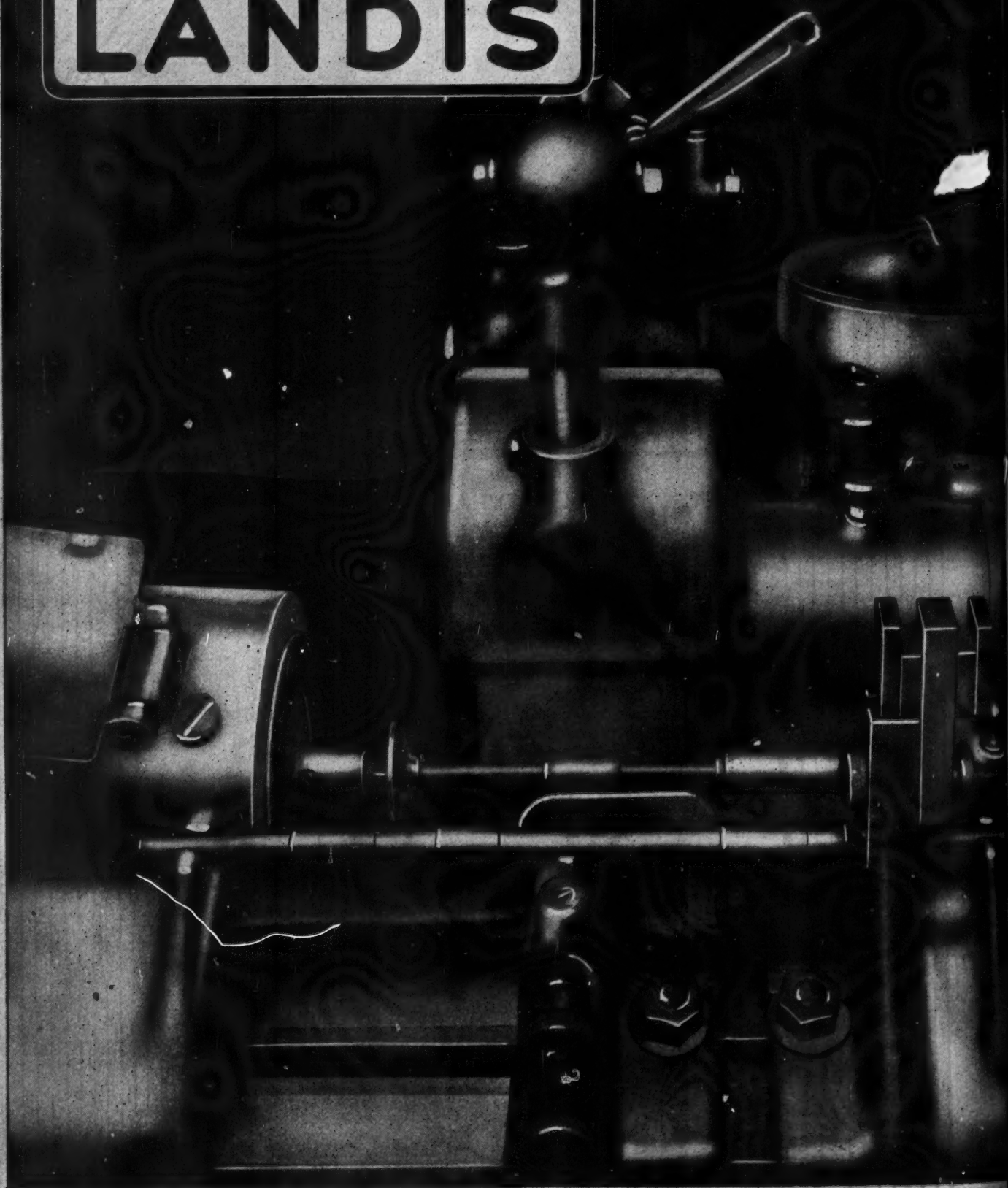
U. S. S. Set Screws, Milled or Upset.

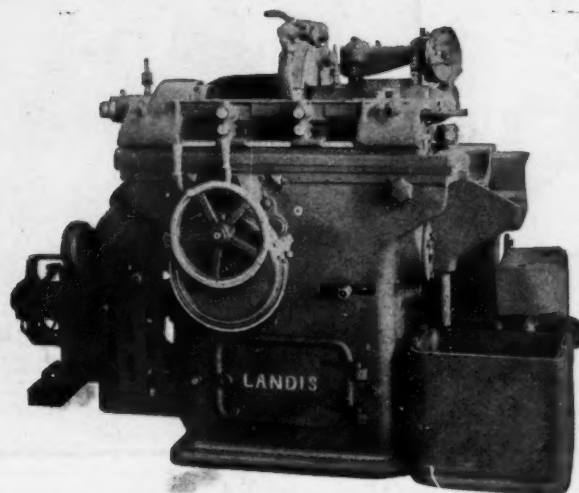
S. A. E. Milled Nuts, Plain or Castellated.

Exceptional facilities for special screw machine work to specifications.

The National Acme Company

Cleveland New York Boston Buffalo Detroit Chicago

LANDIS



When the Industry thinks of
Production Grinding ———
it thinks of ———

LANDIS

Back in 1890 the first Landis Grinding Machine was built. The direct descendants of this first grinder are now numbered in tens of thousands, a large percentage of them being in the automotive industry.

In practically every automotive plant, regardless of the kind of automotive vehicle built, regardless of the price it sells for, you will see batteries of these high production grinding machines.

Fully 80% of the industry's crankshafts are handled on Landis Grinding Machines.

The LANDIS line is extensive. There are plain machines, camshaft machines and piston machines. There are cylinder grinding machines, ball-race machines, universal machines for tool rooms.

Made by the largest builders in the world of grinding machines exclusively. Catalog and quotations gladly mailed upon request.

Landis Tool Co.

Waynesboro, Penn.

New York Office,

30 Church St.



How will that all-metal timing train sound a year from now?

THE gear teeth will be worn. And all-metal gears when worn are always noisy. The hum and snarl of noisy timing gears worries and irritates drivers.

The motorist of today wants his timing-gear set proof against the annoyance of humming, howling gears. You can protect the men who drive your cars against noise. You can make your timing gear sets *permanently silent*.

Many manufacturers prevent timing gear noise *for the life of the car* with Celoron Silent Timing Gears. Properly mated with metal gears, these gears eliminate metal-to-metal contact—the cause of noise. They insure silence in the timing gear case.

Car manufacturers who silence their timing trains with Celoron Silent Timing Gears also hammer down production costs by the use

of these gears. Gears of Celoron effect an actual saving in machining cost, reduce front-end tear-downs, help keep the assembly line moving.

The following cars are equipped with these resilient, durable, non-metallic gears:

Apperson	Dort	Haynes (55)	Maxwell
Courier	Elcar	Jewett	Nash
Dorris	Rollin	Gardner	Marmon
			Oldsmobile

Cut or molded gears of Celoron fit any timing gear set. Garages, repairmen, and service stations all over the country carry stocks of these non-metallic, silent gears.

You can get Celoron in sheets. You can get gear-blanks cut from sheet stock or molded. Stabilized Celoron is being produced in quantity. Celoron is a laminated phenolic condensation material bonded with bakelite. Gears are cut for the replacement trade by Dalton and Balch.

Look for the "Celoron" and "D & B" marks. They insure your getting a genuine Celoron Silent Timing Gear.

SILENCING MACHINE GEAR DRIVES

For every direct drive used in factories there is a Celoron Silent Gear. These gears drive big punch presses, pumps, and cranes. On all the rugged and delicate production machines Celoron Silent Gears work effectively and silently. They are cut from Celoron, a laminated phenolic condensation material, bonded with bakelite.

CELORON SILENT GEARS



Celoron molded
cam gear



Celoron crank and
generating gears

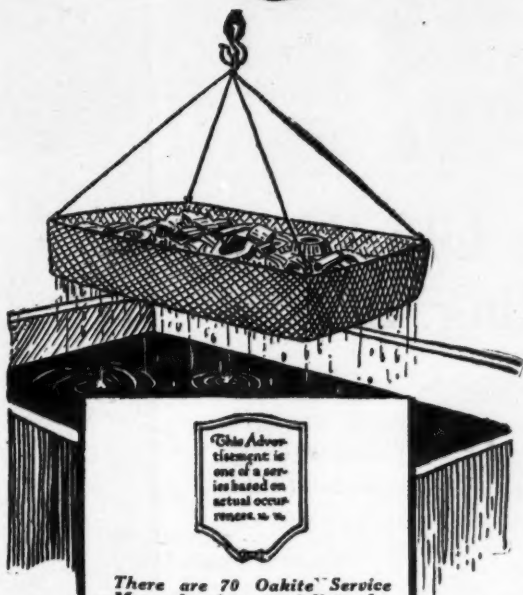
Diamond State Fibre Company

BRIDGEPORT, PENNSYLVANIA

Branches in Principal Cities

Toronto, Canada—London, England

Free Consulting Service



There are 70 Oakite Service Men, cleaning specialists, located at:—

ALLENTOWN, PA.
ATLANTA, GA.
BALTIMORE
BOSTON
BRIDGEPORT
*BROOKLYN
BUFFALO
CAMDEN
CANTON, O.
CHARLOTTE, N. C.
*CHICAGO
*CINCINNATI
*CLEVELAND
*DALLAS
*DAVENPORT
DAYTON
DENVER
*DES MOINES
*DETROIT
ERIE
FLINT, MICH.
GRAND RAPIDS
HARRISBURG
HARTFORD
*INDIANAPOLIS
*KANSAS CITY
*LOS ANGELES
*MILWAUKEE
*MINNEAPOLIS
*MONTREAL
NEWARK
NEW HAVEN
NEW YORK
*OAKLAND, CALIF.
PHILADELPHIA
PITTSBURGH
PORTLAND, ME.
POUGHKEEPSIE
PROVIDENCE
READING
ROCHESTER
ROCKFORD
ROCK ISLAND
*SAN FRANCISCO
SCHENECTADY
*SEATTLE
*ST. LOUIS
SYRACUSE
TOLEDO
*TORONTO
UTICA
WATERLOO, IA.
WILLIAMSPORT, PA.
WORCESTER

*Stocks of Oakite Materials are carried in these cities.

The Oakley Chemical Company offers you a Free Consulting Service on any kind of a cleaning or related problem. A personal study of your present methods, equipment, materials and special conditions, by an Oakite Cleaning Specialist, will lead to lower cleaning costs, faster cleaning, better results and other advantages. Through Oakite Service you focus on your problems 15 years' experience in thousands of plants.

Why this Service will save you money—

The Oakite Cleaning Specialist is able to save you money because he is able to apply to your own needs the methods that are giving best results throughout the entire country. The day of the specialist is here. No man can know all about everything.

The Oakite Cleaning Specialist has made industrial cleaning his life study. He is thoroughly posted on every improvement that has taken place in recent years. He must know and does know why cleaning troubles exist, and how they can be corrected. He knows that cleaning costs are not always what they appear to be, and that important savings are often effected, even where costs are apparently already down to bedrock.

How this Service operates for you—

Here is an actual occurrence, showing how the manufacturer is benefited by consultation with an Oakite Service Man. A plant making automobile bumper bars has to remove burnt on quenching oil before japanning. With the methods employed they were getting many rejects. A careful study of the situation by the Oakite Service Man resulted in definite recommendations, which when carried out cut the cleaning time in half, and because of thorough cleaning, eliminated rejected parts—the japan took perfectly. Just what were these recommendations? For one thing, it was found that there was a poor arrangement of steam coils in the cleaning tank which prevented the temperature being brought up to the required degree. They had also been neutralizing the pickling acid in the cleaning tank, for which they substituted a hot lime dip. Oakite materials were used in place of lye and caustic soda. With these changes, a 15 minute immersion instead of former 30 minutes, was all that was necessary to entirely remove the oily scale.

Get the whole story Write for booklet today—

Our booklet "Modern Metal Cleaning" will give you a comprehensive idea about Oakite methods and materials, and why it will be profitable to you to apply to your own work the best experience on all kinds of cleaning that can be brought to bear. Free copy on request.

Oakley Chemical Co. General Offices: 28 Thames St. New York, N.Y.

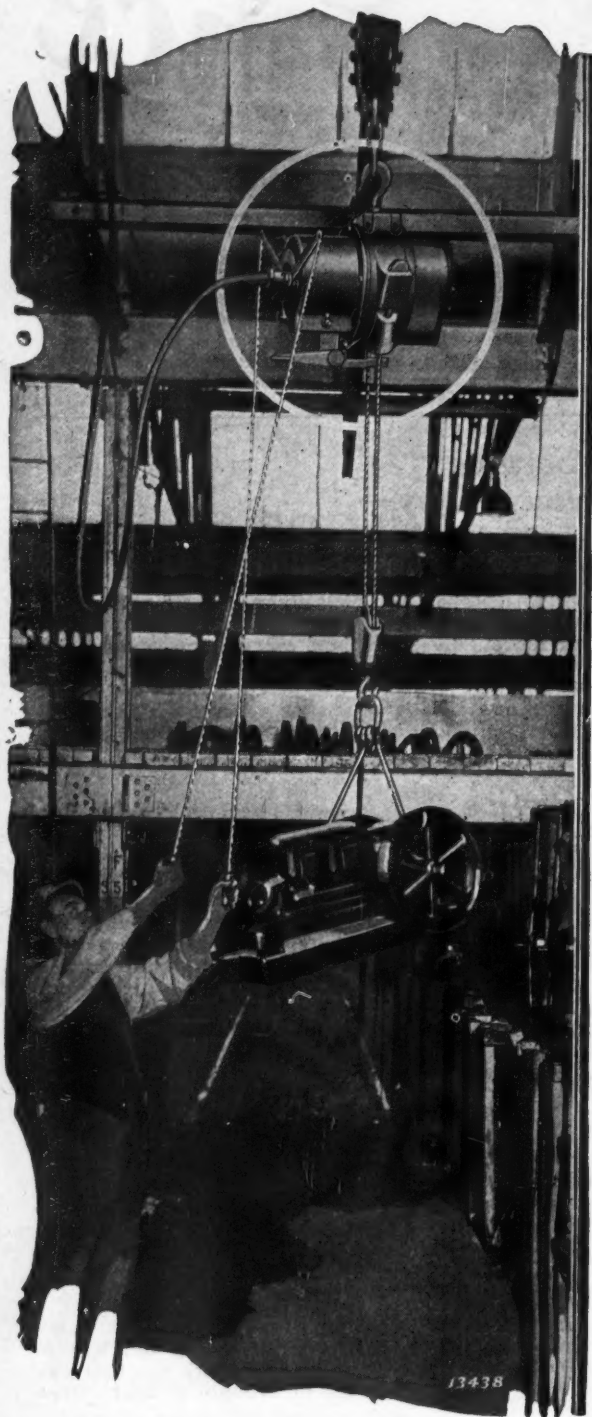
OAKITE

TRADE MARK REG. U.S. PAT. OFF.

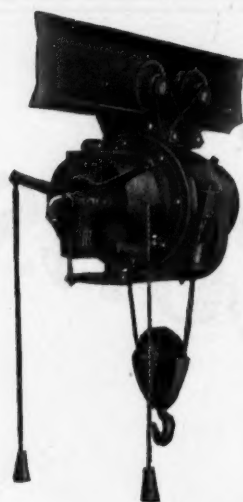
Industrial Cleaning Materials

NEW-Air Motor Compact, Safe,

Hoists Rugged



Size C Air Motor Hoist (capacity 2000 lbs.) handling material in large factory stock room.



Replace Old Ways of Lifting Loads

In warehouses, shipping rooms, press rooms, garages, silk mills, stone yards, in fact in every line of business and industry, there are applications where Ingersoll-Rand Air Motor Hoists replace old fashioned and expensive ways for lifting and moving loads.

Ingersoll-Rand Hoists have been selected because they contain more advanced features than any other hoist. They are compact and require low head room, are relatively light weight, have automatic brakes which positively hold the load, need little attention except occasional lubrication, and are practically trouble free.

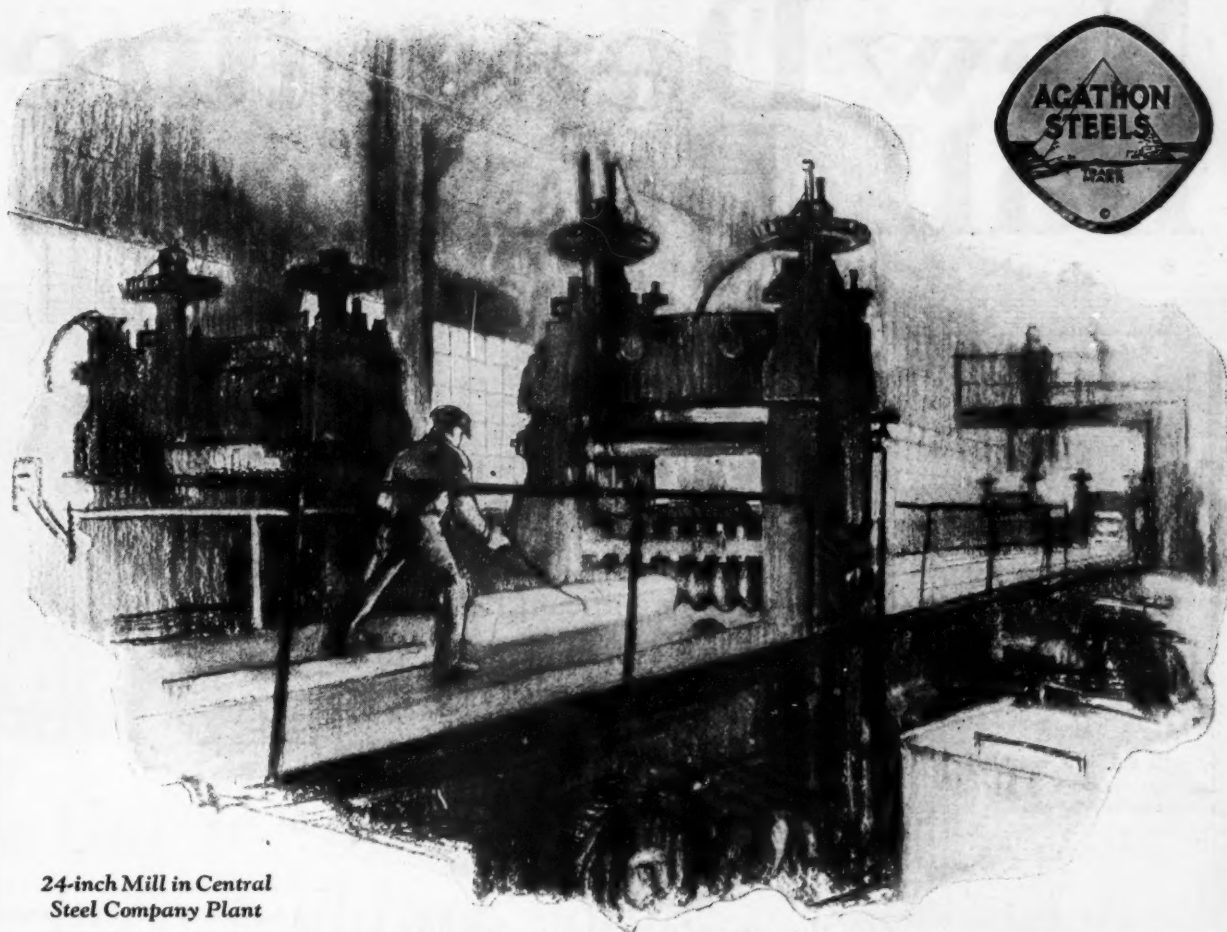
Ask for detail information on these labor and money saving hoists. Five sizes, capacities 500 pounds to 10,000 pounds. Furnished with either hook or roller bearing trolley mounting.

Ingersoll-Rand Company
11 Broadway, New York City

Offices in All Principal Domestic and Foreign Cities
For Canada, refer Canadian Ingersoll-Rand Company,
Limited, 260 St. James Street, Montreal, Quebec.



Ingersoll-Rand



24-inch Mill in Central
Steel Company Plant

AGATHON ALLOY STEELS

OUR Metallurgical Department is maintained on the highest possible plane. It is abundantly supplied with the latest scientific equipment to be had and manned by a corps of expert metallurgical engineers and practical steel producers.

Through our years of experience in the production of commercial alloy steels this department has amassed and compiled a great amount of data on the adaptability of various special steels to hundreds of different lines of manufacture.

If a stronger, tougher or harder steel can be produced to meet the peculiar requirements of the highly stressed and excessive wearing parts of your product, our metallurgists can tell you and our mills can produce it. Write us. Get the co-operation of our organization and extensive facilities now. Remember it places you under no obligations.

We have a daily production in all kinds of Agathon Alloy Steels such as—

Nickel, Chrome-Nickel, Uma, Molybdenum, Chrome-Molybdenum, Nickel-Molybdenum, Vanadium, Chrome-Vanadium, Chromium, etc.

Deliveries in Blooms, Billets, Slabs, Bars, Hot Rolled Strips, etc.

THE CENTRAL STEEL COMPANY, Massillon, Ohio

SWETLAND BLDG.
CLEVELAND

BOOK BLDG.
DETROIT

PEOPLES GAS BLDG.
CHICAGO

UNIVERSITY BLOCK
SYRACUSE

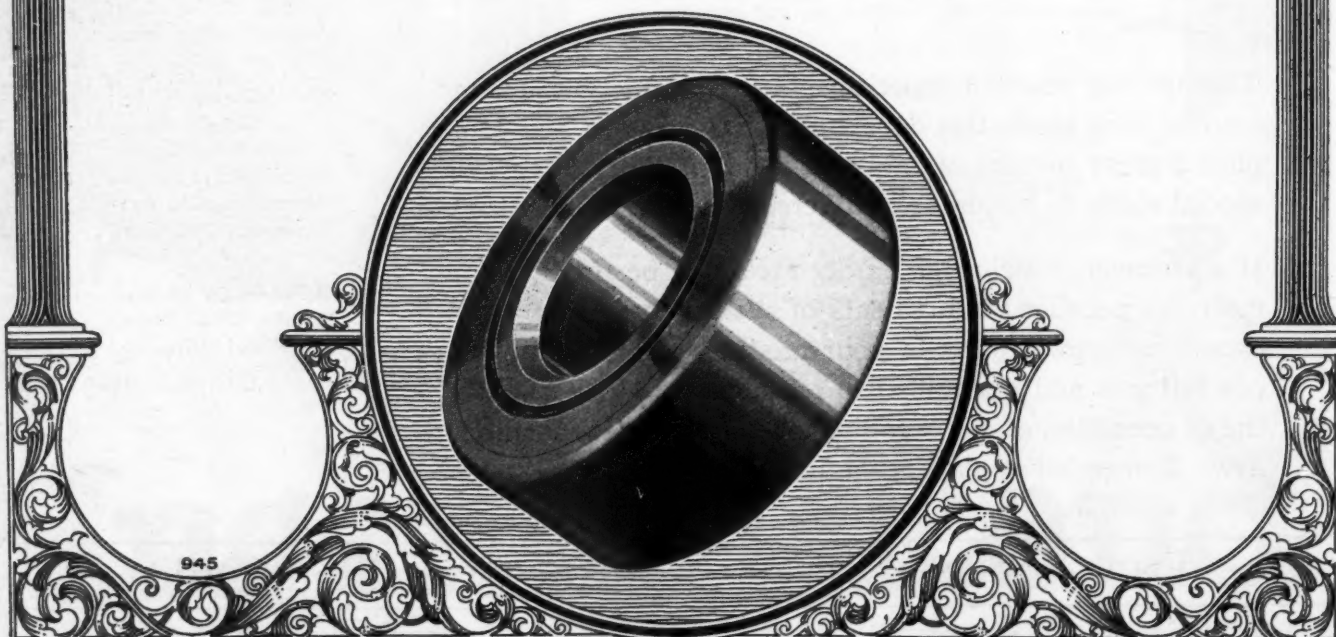
WIDENER BLDG.
PHILADELPHIA

New Departure Ball Bearings

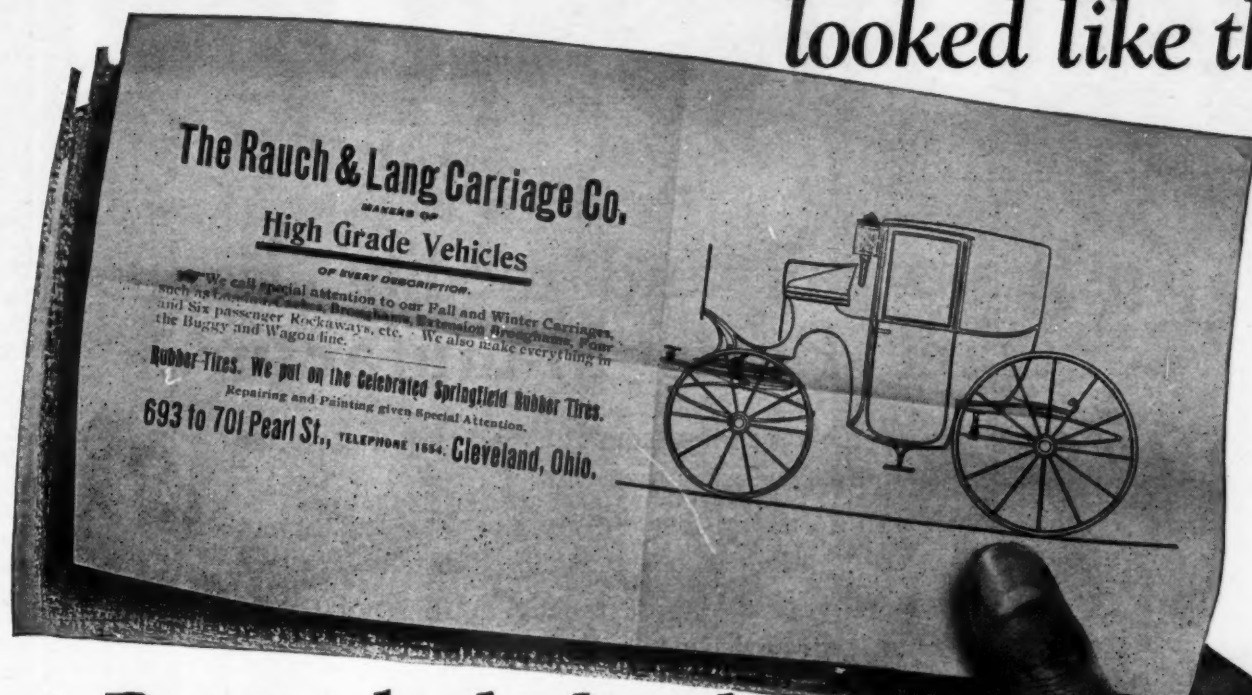
It is a mighty significant fact that racing cars invariably use ball bearings throughout.

—and that New Departures were overwhelmingly predominant in the races of the last five years.

On the speedway dependability can be the only consideration.



30 years ago our advertising
looked like this



But we had already
been building bodies
for FORTY years

The thirty-year-old advertisement shown above is reproduced from a theater program.

Our advertising has changed in appearance. Our Closed Bodies have changed in their application. Our task, nevertheless, is still as in the beginning, seventy years ago, to aid in the building of "high grade vehicles."

Recent additions to our plant give us ample facilities for greater production, and this, together with financial responsibility and a long record of training in delivery promises faithfully kept, enables us to maintain a steady delivery of closed bodies in strict accordance with specifications and exactly on time.

Raulang Body Division

THE BAKER R & L COMPANY
CLEVELAND, OHIO, U. S. A.

Raulang
TRADE MARK

C L O S E D A U T O M O B I L E B O D I E S



To the small and medium-sized Contract Parts Manufacturer

No doubt your business comes from one, two or at most a half-dozen big customers.

What would you do if you lost only one of these customers? How would you go about it, to get business to take its place?

You can prepare yourself against such a time by inviting correspondence from new prospective customers.

Make yourself and your facilities known. Get yourself listed as a source of supply. Open preliminary negotiations *before* you actually need business; and avoid extremely competitive bidding.

Make a start toward this desirable condition by advertising your facilities in the Broadcaster Section of Automotive Industries. Try it a few months and see if you can't have more profitable business in your plant, by, say, this time next year.

* * * * *

Use Broadcaster advertising to get work for idle equipment—to buy machinery you need or dispose of machinery you want to sell—to hire a reliable employee or find a better job—to secure agents or agencies. This is the opportunity advertising of the world's greatest industry—inexpensive, quick-acting, result-producing publicity. Undisplayed ads cost only 6c a word.

Consult the Broadcaster Department—Advertise in the Broadcaster Department—Watch the Broadcaster Department grow!

The Broadcaster

A DEPARTMENT THAT
WILL FIND WHAT YOU WANT



For Broadcaster rates in Motor World, Motor Age, Automotive Industries, Automobile Trade Journal, Distribution & Warehousing, address the Class Journal Company, 239 W. 39th St., New York.

EMPIRE *New Process* BOLTS

**"—Yet It Takes Hours to
Make a Gauge"**

The main difference between an Empire New Process bolt and a hardened and ground gauge is in appearance. In accuracy there is little to choose between them.



Yet it takes hours to make a gauge, and only a second or two to make an Empire New Process bolt.

But back of that "second or two" are 79 years of leadership in bolt making—accounting for the remarkable machine tool development that made the new bolt possible.

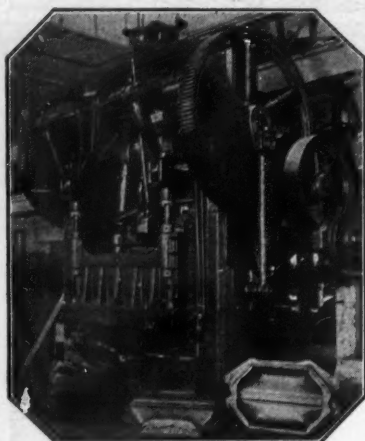
RUSSELL, BURDSALL & WARD
◎ BOLT & NUT COMPANY ◎

PORT CHESTER, N.Y.

YEMBRIDGE, CONN. • CHICAGO • SAN FRANCISCO • ROCK FALLS, ILL.

Makers of Bolts, Nuts and Rivets Since 1845

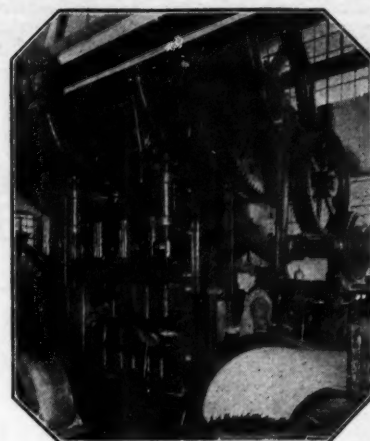




"BLISS" No. 409-D Patent Double
Crank Toggle Press making cowls

*In the
Auto Field*

**Bliss
Presses**



"BLISS" No. 410-B Patent Double
Crank Toggle Press making fenders

THE ILLUSTRATIONS show two BLISS Presses producing automobile parts.
BLISS Presses are also used in the making of brackets, running boards, flywheels, lamp
parts, rear axle housings, crank cases, oil cases and covers, gas tanks, baffle plates, etc., etc.
Photographs by courtesy of our customers.

Bliss for Machinery

E. W. BLISS CO. MAIN OFFICE AND WORKS BROOKLYN, N. Y., U. S. A.

SALES OFFICES: DETROIT (Dime Bank Bldg.) CLEVELAND (Cleveland Discount Bldg.) CHICAGO (Peoples Gas Bldg.) PITTSBURGH (Oliver Bldg.) ST. LOUIS (Boatmen's Bank Bldg.) BUFFALO (Marine Bank Bldg.) CINCINNATI (Union Trust Bldg.) NEW HAVEN (Second Nat'l Bank Bldg.)

American Factories: BROOKLYN, N.Y. HASTINGS, MICH. CLEVELAND, OHIO. SALEM, OHIO.

ENGLAND, Pocock St., Blackfriars Rd., S. E., London
No. 314

FOREIGN SALES OFFICES AND FACTORIES:
ITALY, 345 Via Nizza, Turin

FRANCE, 54 Blvd. Victor-Hugo, St. Ouen, Paris

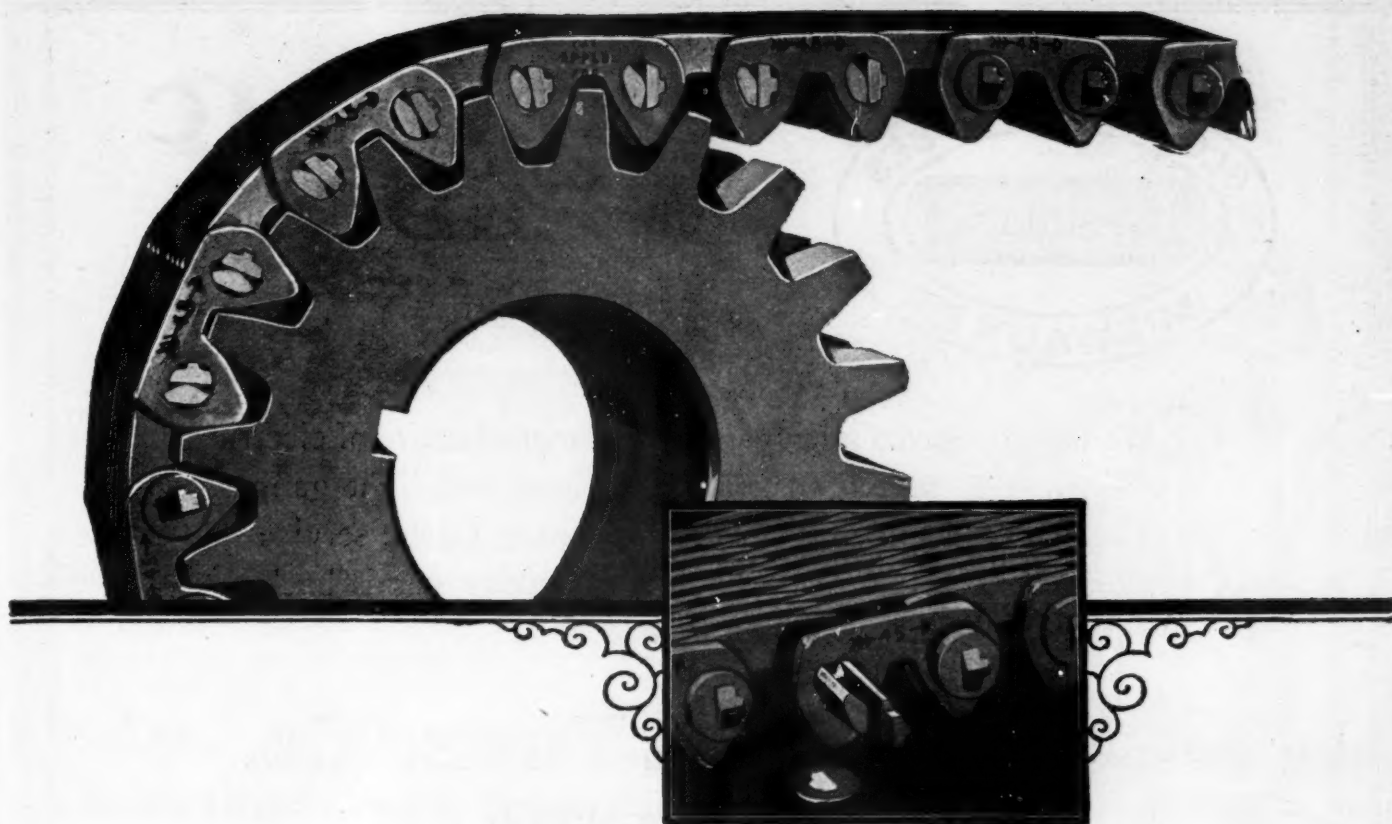


Broadcaster Service

If you are in the market for anything that you do not find advertised in this paper, tell us and we will promptly send you a list of the leading manufacturers.

If you want work done, or prices on anything, and do not know to whom to send your inquiry, write us and we will do our best to help you.

The Broadcaster
A DEPARTMENT THAT
WILL FIND WHAT YOU WANT



**These Cars Have
Standardized on Morse**

Anderson Six
Auburn Six
Barley Six
Cadillac Eight
Case Six
Chalmers Six
Chandler Six
Chrysler Six
Cleveland Six
Columbia Six
Crawford-Dagmar Six
Davis Six
Elcar Six
Essex Six
Flint Six
Fox Six
Hupmobile Four
Hudson Six
Jordan Six
Lafayette Eight
Lincoln Eight
Moon Light Six
National Six
Northway Four
Oakland Six
Packard Six
Packard Eight
Peerless Six
Rickenbacker Six
Stearns Four
Sterling-Knight Six
Studebaker Light Six
Star Four
Templar Four
Winton Six
Continental Motors

The "Rocker Joint"

FOLLOWING the progress of the MORSE "ROCKER JOINT" SILENT CHAIN of more than twenty-five years, there is a history which surrounds all types of Silent Chain. Countless designs of front end chain drives have been tried and failed. Each year new MORSE CHAIN installations have appeared against most exacting competitive tests and proved their supremacy, and today more than 90% of all chain front end drives are MORSE.

A success based upon skillful design and progressive engineering.

MORSE CHAIN COMPANY

Main Office and Works
ITHACA, NEW YORK

Sales and Engineering Office
DETROIT, MICHIGAN

MORSE

GENUINE SILENT CHAINS



ELECTRIC WELDED TUBING

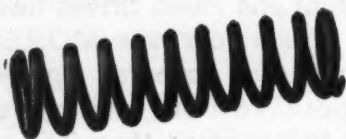
We have opened a new plant for the manufacture of electric welded steel tubing in small diameters and light gauges. The same organization which has made Globe service in the Seamless Steel Tube line so distinctive stands back of this new product. Let us prove it.

GLOBE STEEL TUBES CO.
MILLS: MILWAUKEE

CHICAGO: 1039 Peoples Gas Bldg.

DETROIT: General Motors Building

Raymond Springs

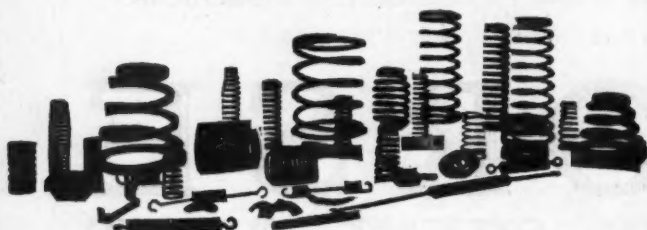


Raymond Springs meet, to the detail, your most particular requirements. 40 years' specialized experience is evidenced in their superlative service. Yet quality is not revealed in their

cost because of our modern methods, complete facilities and volume production. Specify Raymond for all extension, compression or torsion springs.

RAYMOND MFG. CO., Corry, Pa.

SPRINGS



We have specialized in high grade springs for the automotive industries since they began. Our facilities are of the best.
—Send for our booklet on springs.—

THE WILLIAM D. GIBSON CO.

1800 Clybourn Ave.

Chicago, Ill.

**QUALITY
QUANTITY
DELIVERY**

the three requisites
for spring satisfaction
are component parts

of

**"Barnes - Made
Springs"**

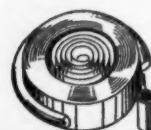
Send us your blueprints
or inquiries

The Wallace Barnes Co.

"Spring Makers for
Three Generations"

Bristol

Connecticut



DIXON'S 677

**FOR TRANSMISSIONS
AND DIFFERENTIALS**

Two or more competing cars may be so nearly equal that long arguments fail to reveal any decisive difference.

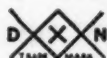
Proper lubrication will reveal and prove the difference because it will make a car out-serve and out-wear its competitor by a very wide margin.

Dixon's 677 will meet fully the most exacting specifications and requirements for gear box lubrication.

Write for more detailed information.

Joseph Dixon Crucible Company

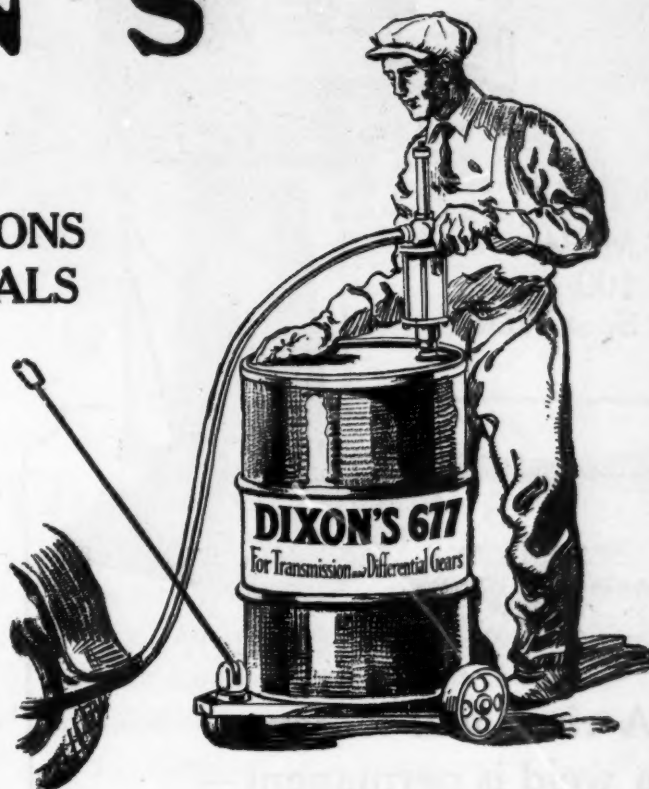
Jersey City



New Jersey

Established

1827



LANCASTER STEEL

Our Laboratory & Sales Metallurgist at your service



COLD DRAWN FACTS

A Stock List including useful information for users of Cold Finished Steel issued on the 15th of every other month and mailed gratuitously upon request.

Write us, giving names of other individuals in your organization whom you wish to receive it.



LANCASTER QUALITY PRODUCTS

COLD DRAWN
(Rounds—Squares—Hexagons)
Bars and Wire
(Alloy and Carbon)
Screw Stock
(Bessemer and Open Hearth)
COLD ROLLED
Strip
(Any Analysis—Any Temper)

LANCASTER STEEL PRODUCTS CORPORATION
THOMAS LANCASTER, PA. U.S.A.

NEW YORK
PHILADELPHIA

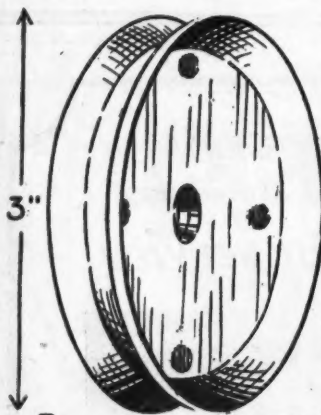
HARTFORD
CLEVELAND

BOSTON
DETROIT

Model
100
Spot Welder



**A rivet will loosen,
a weld is permanent —**



[●-SPOT WELD]

Two stampings of 18 gauge metal, each forming a half of the grooved pulley, are welded together by four spots. The Thomson does a dependable job on these at the rate of 500 welds per hour or 1000 complete wheels per 8 hr. day.

Let spot welding help you make a better product—let us show you how with Thomson Spot Welders. Write for details.

Thomson Spot Welder Co.,

"Pioneers in the Art of Resistance Welding"

Cincinnati, Ohio, and Lynn, Mass.

THOMSON

Pressed Metal Blanking

Our exceptionally complete facilities enable us to furnish pressed steel shapes of every description to fill the requirements of the Automotive Industry.

Being plate manufacturers as well as stampers allows us to do the pressing or stamping without loss of time.

Our output consists of brake drums, bumpers, gear covers, treads, pressed heads—in fact anything and everything pressed or stamped from metal $\frac{1}{8}$ in. thickness and heavier.

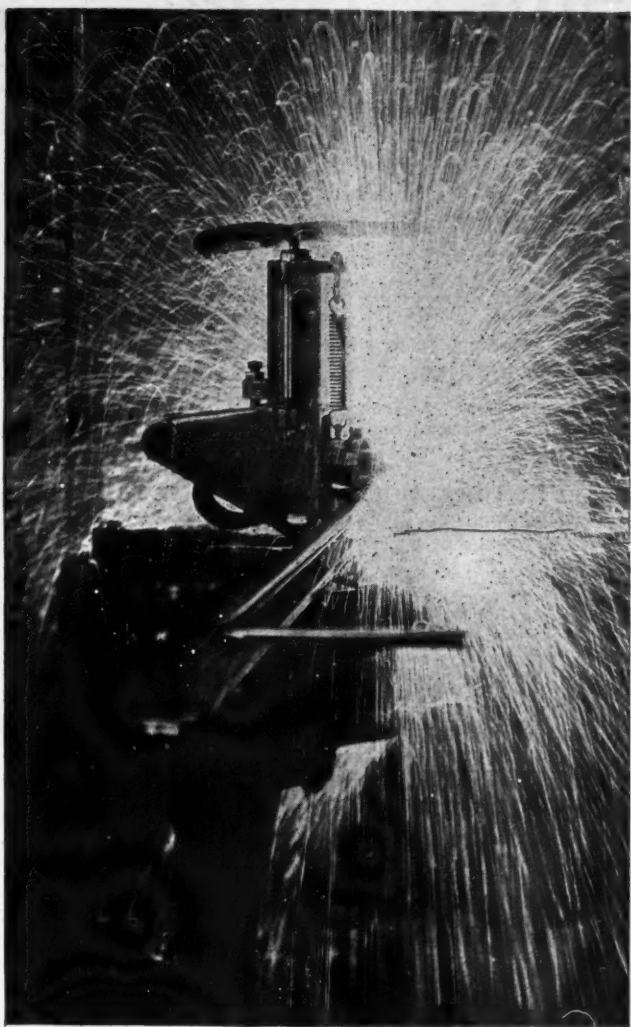
We also make forgings. These are furnished you either rough or completely machined to suit your requirements.

LUKENS was the first to make boiler plate in America and is now the World's Largest Plate Mill.

We will gladly send a representative to take up your specifications or you can send us your blueprints.

The facilities at our command will result in very decided advantages to you.

LUKENS
STEEL COMPANY
COATESVILLE, PENNA.



"Flash" Cannot Harm this Welder

"Flash" getting into the bearings—and on the transformer—of the ordinary welder **SHORTENS ITS LIFE.** But with the new Federal line of "Flash-Proof" Welders, construction is such that no "flash" can get at the vital parts of the machines.

On **WINDSHIELDS**, this No. 60 flash-proof machine has increased production 75%-100%.

Made by the largest plant in the world devoted exclusively to spot, butt and seam welders.

Let us quote production figures on your work. Mail us your blueprints.

Federal

The Federal Machine & Welder Co.
Warren, Ohio

Branches in twelve principal cities.



The Nation's choice

for Chief Magistrate is a matter of speculation, but its choice in the matter of automobile tool equipment has been unmistakably registered on the sales records of the Crescent Tool Company.

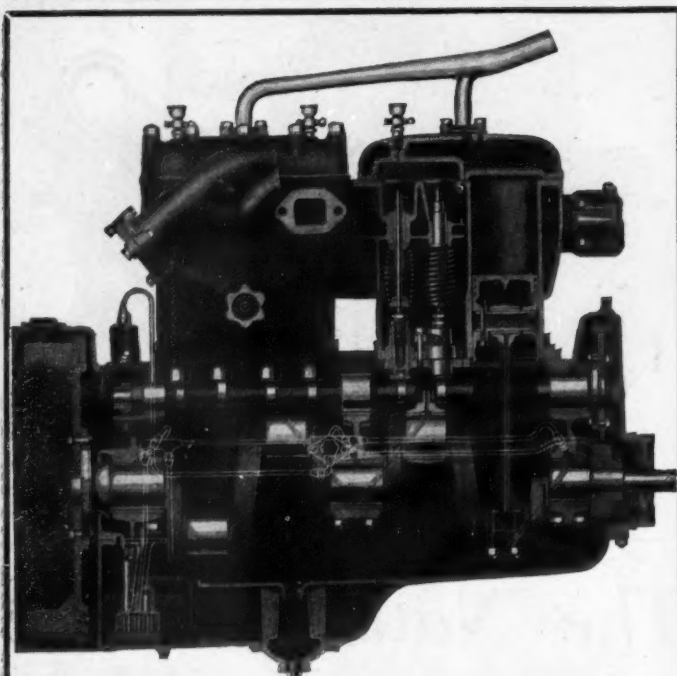
On first acquaintance the Crescent Wrench promises handy adaptability to a variety of emergencies, easy adjustment, firm grip, and effectiveness in the awkward narrow corners where most wrenches are helpless. On further acquaintance, it fulfills those promises with a faithfulness that many a political candidate could well emulate.

No car is completely equipped without a Crescent Wrench.

CRESCENT TOOL COMPANY
201 Harrison St., Jamestown, N. Y.

Originators and Manufacturers of

CRESCENT WRENCHES



THE original idea back of Hinkley Engines, and which influenced their designs throughout, was to make an engine of superlative performance, which would in point of longevity, economy of operation, and satisfactory development of advertised power satisfy the most critical.

This resolve was taken in 1917 and never for a moment has this platform been abandoned. Neither design, materials nor workmanship have been cheapened to produce a "price" engine, yet by reason of the veteran skill behind Hinkley engines, the prices of them remain surprisingly low, quality considered.

The ultimate user is growing very discriminatory. He knows more about engine construction than he used to in pre-war days. He demands fine engines in his machines, and will insist that you use them. He asks for an engine with the following attributes:

- 1st Maximum horse power for every drop of fuel.
- 2nd Unlimited Engine Life.
- 3rd Minimum upkeep expense.
- 4th Power developed with minimum of vibration.
- 5th Accessible for all necessary adjustments or inspection.
- 6th Backed by nation-wide service.

In other words, he needs the Hinkley Engine.

Naturally enough you ask for proofs from us as to our claims. You can have an abundance of evidence to substantiate our assertions concerning Hinkley Engines, and the disinterested testimony of users of our product under every condition of service.

Can you use Hinkley Engines in your products, or rather, can you afford *not* to use them?

THEIR USE WILL PLACE IN THE HANDS OF YOUR CUSTOMERS A POWER PLANT THAT WE BELIEVE IS EXCELLED BY NO OTHER HEAVY DUTY AUTOMOTIVE ENGINE ON THE MARKET TODAY.

Model 300..... $3\frac{3}{4}$ x $5\frac{1}{4}$ "
Model 400.....4 x $5\frac{1}{4}$ "
Model 500..... $4\frac{1}{4}$ x $5\frac{1}{2}$ "

Model 200 $4\frac{1}{2}$ x $5\frac{1}{2}$ "
Model 100 $4\frac{3}{4}$ x 6"
Model 1700.....5 x 6"

HINKLEY MOTORS, Inc.

P. O. Box 839
DETROIT, MICHIGAN

HINKLEY
HEAVY DUTY AUTOMOTIVE
ENGINES

170 "in stock" sizes in quantities to meet your needs

Specify "Elephant Brand" Phosphor Bronze "S" Bearing Metal wherever you require bushings of extreme hardness, durability and heat resistance.

For fifty years, the dependable source for dependable bushings. Immediate deliveries from stock. Also furnished cast in the rough to specification.

Send for list of stock sizes.

The Phosphor Bronze Smelting Co.
2200 Washington Ave. Philadelphia, Pa.

Phosphor Bronze BUSHINGS





The
World's Largest Ball Plant

STEEL · BRASS · BRONZE
MONEL METAL
BELL METAL
ALUMINUM
and
HOLLOW BALLS

HOOVER STEEL BALL CO.
ANN ARBOR, MICHIGAN

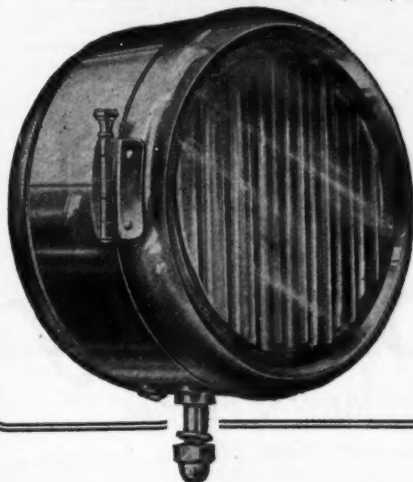


Lamps which help to sell the Car

When lamps are chosen with a thought to their artistic fitness, the resulting ensemble is one of harmonious distinction in which the individual characteristics of the product have been accentuated. Such lamps identify the product and wield a powerful sales influence.

The Aga Organization is at your service to help you in fitting your car with such lamps. If not found in our vast stock of many various styles, our modern facilities and wide experience place us in a position to design and manufacture a lamp to your requirements — in quantities — at quantity prices.

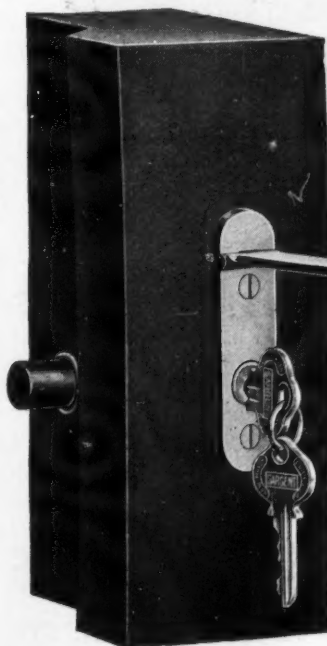
AGA AUTO LAMP CO., Inc., Amesbury, Mass.
Successors to GRAY & DAVIS, Inc., Lamp Division



*Makers of
Headlamps, Side
Lamps, Tail
Lamps, Search-
lights and Spot-
lights, also spe-
cial equipment
for Buses and
Trucks.*

SARGENT

Cylinder Pillar or Door Locks for Closed Bodies



The bolt, made of heavy, drawn brass that is much stronger than a cast bolt, operates independently of the door latch.

The Sargent cylinder provides security with the convenience of the small key.

Many body engineers prefer this lock to the type that "dogs" the latch-bolt.

Sargent & Co.

Manufacturers

New Haven, Conn.

We shall be pleased to quote prices on automobile locks and locking cylinders, to manufacturers of automobiles and bodies.



SHAFER

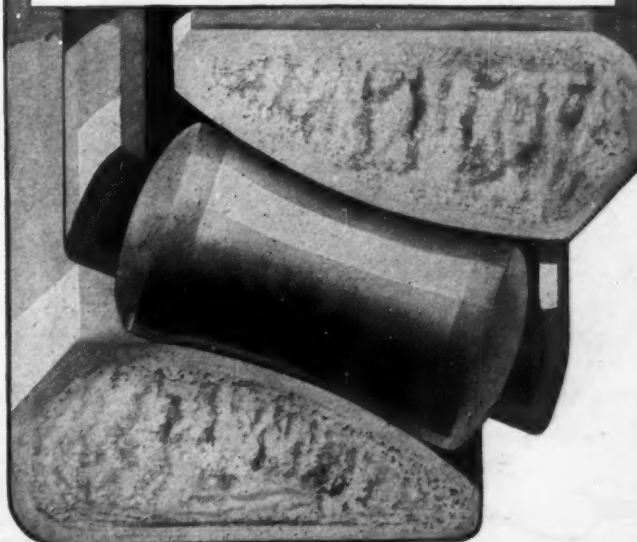
Self-Aligning ROLLER BEARING

PAT. & PATS. PENDING

SHAFAER Roller Bearings combine the rotating freedom of ball bearings with the maximum load capacities of Roller Bearings, carrying all combinations of thrust and radial loads. They are also self-aligning.

*Furnished in
Interchangeable Sizes*

SHAFAER BEARING CORPORATION
6501 WEST GRAND AVENUE
CHICAGO, ILL.





CARRIES THE LOAD
TAKES THE THRUST

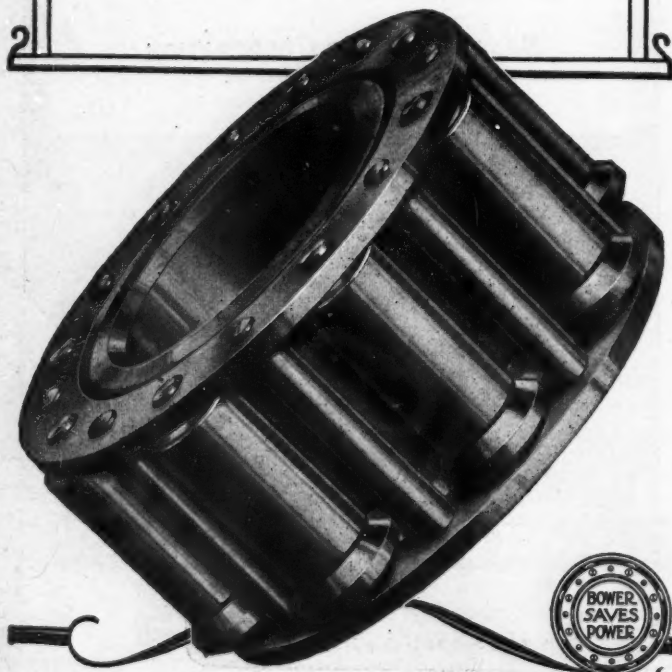
Mr. Engineer:—

What design in a bearing has the most advantages for your problems?

Does not a bearing having capacity for both radial and thrust loads meet your requirements?

Bower design has incorporated thrust and radial carrying surfaces in the Bower Roller Bearing. These surfaces are separate and independent. Besides Bower Roller Bearings do not need adjustment. Bower Bearings never jam.

Bower Roller Bearing Company
Detroit, Mich.



SOMETIMES Rivets fail because they are of improper design for the particular purpose for which they are used.

The use of Rivets is the most economical manner of automotive fabrication—it can also be the safest and most satisfactory method if adequate and expert attention is given to special needs.

The Townsend service embodies cooperation and advice in determining which is the right Rivet and then in producing it.



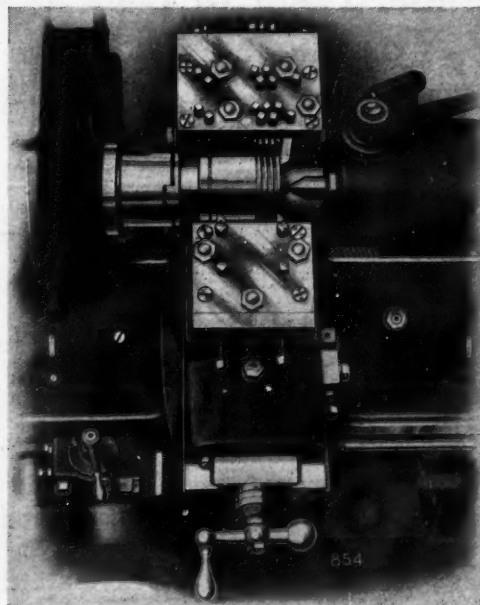
Townsend can supply Cold Made Rivets—standard or special—every kind and all sizes. Automobile Body Nails, Clevis or Yoke End Pins, Pipe Plugs, Wire—straightened and cut—and other wire products.

Townsend Company

NEW BRIGHTON, PENNA.

Oldest and Largest Rivet Mill in America

THE MULTI-CUT LATHE

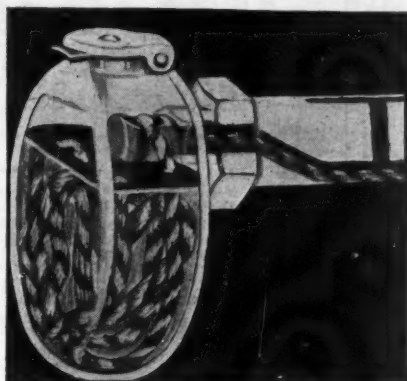


LeBlond No. 9 Multi-Cut Lathe with special tooling for finish-turn operation on cast iron piston. Production, 55 per hour.

Equally remarkable production records have been established on transmission gears, steering knuckles, wheel hubs and similar automotive parts. Our engineering department will be glad to assist with your production problems.

THE R. K. LeBLOND MACHINE TOOL CO.
Cincinnati, Ohio

ARE YOU TRYING TO IMPROVE
YOUR CHASSIS LUBRICATION?



Put Gits Chassis Oilers To THE TEST!

Oil's the thing! Prominent automotive engineers have become really concerned over chassis and brake lubrication. A 12,000 mile test of Gits Oilers produced a "No wear" report. Not merely "Oil Cups" but Gravity and wick-fed Capillary Lubrication—positive and constant.

Send blue prints or particulars for
Sample Installations.

GITS BROS. MFG. CO.
1920 S. KILBOURN AVE. CHICAGO, ILL.

DETROIT TIRE CARRIER

CARRIES BALLOON EQUIPMENT AS EASILY
AND READILY AS STANDARD
EQUIPMENT

NO STRAPS OR METAL PARTS TO CHAFE THE TIRES



DETROIT CARRIER & MFG. CO.
DETROIT, U. S. A.

WHEN SERVICE *is the* DECIDING/ INFLUENCE



TO know where they can place utter reliance upon good service often forms the deciding influence among buyers of Cold Drawn Steels. It is readily conceivable that in many instances first choice in quality might be sacrificed for service if, in an emergency, a buyer felt that both could not be had.

Fortunately, this combination — so often lacking — is absolutely assured with Union Drawn Steels. The perfect linking of service with quality is developed here to such a degree that regardless which forms the deciding influence, dependence can confidently be placed in us.

UNION DRAWN STEEL COMPANY

Warehouses: New York Philadelphia Chicago
Cincinnati Detroit

Sales Offices: Boston Buffalo Cleveland
Milton Pray Co.: Los Angeles, San Francisco, Seattle

Mills: Beaver Falls, Pa. Gary, Ind.

BEAVER FALLS PENNA

WIRE

IGNITION
AIRPLANE
SPRINGS

Everything in Wire
Send for Descriptive Catalogues

**American Steel & Wire
Company**

CHICAGO
NEW YORK
CLEVELAND
PITTSBURGH DALLAS
DENVER BOSTON
U. S. STEEL PRODUCTS CO.

If you use *sheet metal of any type* in automobile construction, we can furnish products in quality and finish specially suited to your requirements. We specialize in the production of

AUTOMOBILE SHEETS

IN ALL GRADES

This Company manufactures a line of Steel Sheets adapted to every phase of the automobile industry: Auto Body Stock, Fender and Hood Stock, Crown Fender Stock; also material for tanks, guards, radiators, frames, lamps, stamped parts, etc. "TRUBITE" Deep Drawing Stock is remarkable for its drawing qualities. Write us for full information on Deep Drawing Sheets, Enameling and Japanning Stocks, Black and Galvanized Sheets, Formed Roofing Products, Tin and Terne Plates, etc.

AMERICAN SHEET AND TIN PLATE COMPANY, Frick Bldg., Pittsburgh, Pa.

Coil Spring for Automotive Purposes

We are spring specialists. A large department in our factory is devoted to the production of high grade coil springs for automotive purposes. We are equipped to give prompt, satisfactory service on these springs, ranging from .005 inch up to .135 inch wire.

All information covering quality, sizes and prices will be furnished upon request.

QUALITY
RIGHT

PROMPT
DELIVERIES

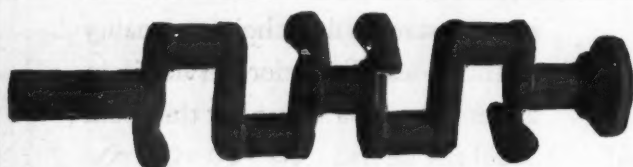


Peck Spring Co.

Plainville, Conn.

If you have a want that anyone in the industry can satisfy, advertise it in the Broadcaster section of this paper.

*Use your business paper
to reach business men.*

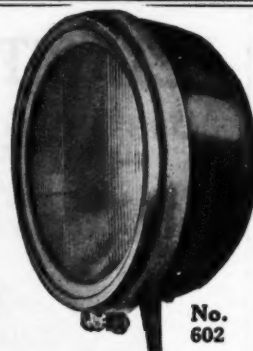


COUNTER-BALANCED CRANK SHAFTS

And HEAVY DIE FORGINGS

The Park Drop Forge Co.
Cleveland, Ohio

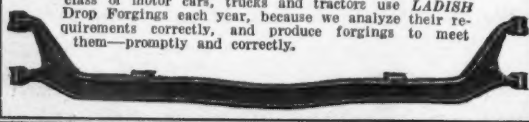
L Automobile LAMP of Distinction



THE JNO. W. BROWN MFG. CO.
COLUMBUS, OHIO, U. S. A.

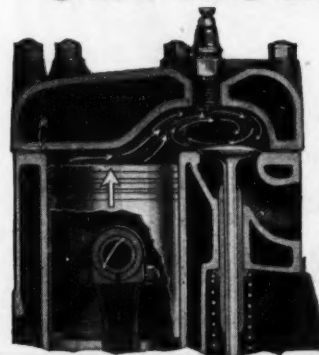
© LADISH, © QUALITY DROP FORGINGS

An increasing number of manufacturers of the better class of motor cars, trucks and tractors use LADISH Drop Forgings each year, because we analyze their requirements correctly, and produce forgings to meet them—promptly and correctly.



LADISH DROP FORGE COMPANY
Cudahy (Suburb of Milwaukee) Wisconsin

The Ricardo Head



All that science and skill could conceive was applied in the development of the Ricardo Head.

It represents a distinct revision in combustion chamber design that provides wide improvement in engine performance.

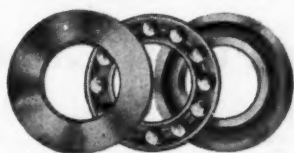
No other development promises to attain greater buyer consideration when important specifications are referred to.

**WAUKESHA
Motor Company**
ENGINE BUILDERS

Waukesha Wisconsin
NEW YORK DETROIT

THOMPSON SILCROME VALVES WON'T BURN

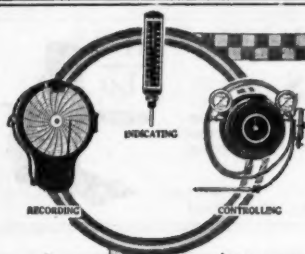
Originated and manufactured by
THE STEEL PRODUCTS CO.
CLEVELAND DETROIT



STAR BALL RETAINERS for Thrust, Magneto
and Cup and Cone Types of Bearings

The Bearings Company of America
Lancaster, Penna.

Western Sales Office
1012 Ford Bldg., Detroit, Mich.



Tycos

temperature
instruments

have a capacity that is measured solely by the
temperature requirements of the particular industry
for which they are designed.

Send for Pyrometer Catalog today.

Taylor Instrument Companies
ROCHESTER N.Y.

There's a Tycos or Taylor Temperature Instrument for Every Purpose

AZ

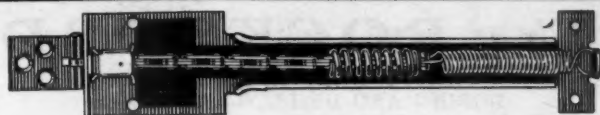
STAMPINGS

HOODS
FENDERS
RADIATORS
TANKS
TOOL BOXES
Etc.

Send your blueprints and
specifications for estimates.

York Corrugating Co.
York, Pa.

Any Size or
Description



Style No. 1

Pat. Oct. 20, 1922

More efficient than door straps—
and they cost no more.

Strong, positive and silent, this *Concealed Door Check* will never fail.
The blued steel chain, running over a friction block of cold rolled
steel and in a silenced channel, never catches or jams. Springs
will function for the life of the car.

Leading makers find that this *Concealed Door Check* is more eco-
nomical than straps. For open and closed cars. Four styles and grades.

Write for your copy of complete catalog.

THE CONCEALED DOOR CHECK CO., INC.
KOKOMO, INDIANA, U. S. A.

A Production Booster

These Self - Oiled, All - Geared
drills and tappers are increasing
production wherever installed be-
cause the operator has nothing to
do but handle the work.

Our experience with *Special* pro-
duction problems is at your
service.

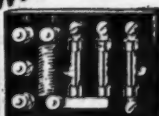
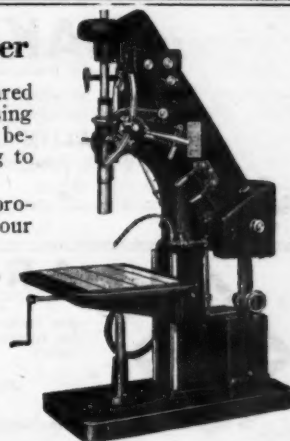
May we send Catalog "E."

BARNES DRILL CO.

Incorporated 1907

817-847 Chestnut Street

Rockford, Ill., U. S. A.



Ford Fuse Block



No. 1 A G



No. 3 A G



UNION FUSES AND ACCESSORIES

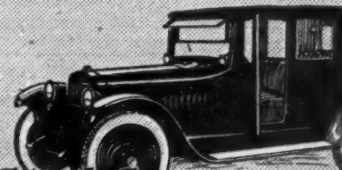
Fuses for every make of car. Fuse Block
protects Ford lights and wiring. Also Fuse
Boxes, special parts, stampings, etc.
Guaranteed satisfactory by oldest and
largest manufacturers of electrical protect-
ing devices.

Write for catalog.

CHICAGO FUSE MFG. CO.
Chicago New York

'CARNEGIE' FLYWHEEL BLANKS ALLOY STEEL

SPECIAL BODY
SECTIONS
BRAKE DRUM
FORGINGS



Carnegie Steel Company
PITTSBURGH, PENNA.

The ROCKFORDHEAVY DUTY HORIZONTAL
BORING AND DRILLING MACHINESTell us your production requirements, and we'll be
glad to show you what the Rockford will do for you.THE ROCKFORD DRILLING MACHINE CO.
Rockford, Ill. U. S. A.**Lakeside****Malleable**Racine,
Wisconsin**Castings****Company**Chicago Office:
38 S. Dearborn St.**BAKELITE**

TRADE MARK REG. U. S. PAT. OFF.

Standard for many Automotive Parts. In Laminated Sheets,
Rods, and Tubes, Cements, Varnishes, Lacquers and Enamels.**BAKELITE CORPORATION**

247 Park Avenue, New York, N. Y.

Chicago Office: 636 West 22nd Street

MAXIMUM STRENGTH—MINIMUM WEIGHT

VANADIUM STEEL*"The Master Alloy"***VANADIUM CORPORATION of AMERICA**

120 Broadway,

New York

DROP FORGINGS FROM SMALLEST
TO LARGESTTruck, Automobile, Car and General Forgings
Upset and Machined Forgings**CANTON FORGE & AXLE COMPANY**

2003-2039 DUEBER AVE., CANTON OHIO

The New Semi-Automatic

Lo-swing Lathe

New methods of tooling greatly increase production.

Send Blue Prints for Time Estimate.

Fitchburg Machine Works**Fitchburg, Mass.****ARMORCOTE**
BAKING ENAMELAn exceptionally durable finish that retains
its lustre. In black and a limited number of
colors.

Made by:

John L. Armitage & Co.
Newark, N. J.Manufacturers of paints, varnishes, enamels, for
48 years.TUBING—BRAZED, BUTTED
WELDED LOCKJOINT—STEEL
PLAIN OR BRASS COVERED.
DIE PRESSED FORGINGS
DRAWN METAL WORK**ROME MANUFACTURING COMPANY**

ROME, NEW YORK

Goldie (T.G.) Meachem says:"See my ad in last week's issue? What—
missed it? Well, look for it next week. I'm
printing some gear conversation that will
interest you. Runs every other week."**Meachem Gear Corporation**
Syracuse, N. Y.**ELWELL-PARKER**
TRUCTORSHi
LoHusky electric industrial haulage units for automo-
tive manufacturing and assembling plants. Cranes,
tractor, platform or lift trucks for transferring,
stacking or tiering materials.

Request Catalogue 520.

The Elwell-Parker Electric Company, Cleveland**THE ACKLIN STAMPING CO**

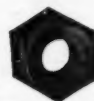
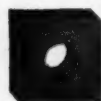
STAMPINGS IN

STEEL BRASS
ALUMINUM

TOLEDO, OHIO

**MACHINE SCREWS**Square and Hexagon
Machine Screw Nuts
"Promco" Quality Brand

Manufactured by

The Progressive Manufacturing Co.
Torrington, Conn., U. S. A.

PIONEER PRODUCERS OF

STEEL PLATES

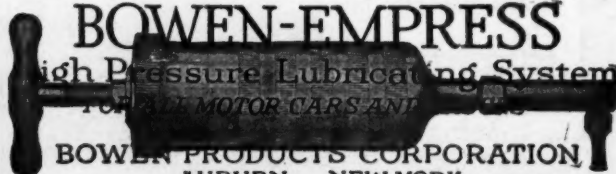
ALSO PRODUCERS OF:

STRIP STEEL (HOT AND COLD ROLLED);
BLUE ANNEALED, FULL FINISHED AND
AUTOMOBILE BODY SHEETS; FURNITURE
STOCK; PIG IRON; STEEL ROLLS; AND
STEEL CASTINGS.**OTIS**
STEEL COMPANY
CLEVELAND, OHIO**Mobiloil**

Make the chart your guide

WE MANUFACTURE
CERTIFIED MALLEABLE
CASTINGS
SPECIFY THEM**ROCKFORD MALLEABLE IRON WORKS**

ROCKFORD, ILLINOIS, U. S. A.

BOWEN-EMPRESSHigh Pressure Lubricating System
FOR ALL MOTOR CARS AND TRUCKS**BOWEN PRODUCTS CORPORATION**
AUBURN, NEW YORK

SOSS

Automobile Body Hardware and Die Castings are used on over thirty of America's most popular cars.

Production—price—delivery.

SOSS MANUFACTURING CO., Inc.
Grand & Bergen St., Brooklyn, N. Y.
Detroit Office, 535 Book Bldg.

BOSSERT

PRESSED METAL PARTS

Send us your specifications and blueprints for an estimate.

THE BOSSERT CORPORATION
Main Office and Works, Utica, N. Y.
Branch Offices—Cleveland Ohio: 1004 Fidelity Mortgage Bldg. Detroit, Mich: 1516 Ford Bldg. New York City: 30 Church St.

Socket Wrenches Are Adapted to Industrial Assembly Work

Various standard stock types will cover the majority of demands.

Special dimensions and sizes of standard types can be furnished for special requirements.

Write for complete information and quotations on your specifications.

Ask for Catalog No. 400.



WALDEN - WORCESTER

INCORPORATED

475 SHREWSBURY STREET
WORCESTER, MASS., U.S.A.

Have You Tried Globe H-C Shot



In your Sand Blast Equipment? Does not pulverize under the impact but is used 250 to 275 times.

Write for samples today.

The Globe Steel Abrasive Co.
MANSFIELD OHIO

BRYANT CHUCKING GRINDER COMPANY

Springfield, Vermont



U. S. PAT. OFF.

Builders of

Hole Grinders

Hole and Face Grinders

Deep Hole Grinders



Contract Work Jigs, Dies, Fixtures

Our facilities are second to none for handling die, jig and fixture work. We also make patterns and design and build special machinery. Send us your prints. Production work.

Toledo General Mfg. Co.
Summit St. Toledo, Ohio

"AETNA"

Thrust Ball Bearings

Automotive Thrust Ball Bearings to Your Specifications.

AETNA BALL BEARING MANUFACTURING CO.
2745 High St. Chicago, Ill.



Seven years of experimental research and more than three-quarters of a million dollars have been expended in developing the ultimate piston material

DOWMETAL

THE DOW CHEMICAL COMPANY *Dow Midland Nick U.S.A.*

Contract Work

Exceptional facilities for producing complete motors, clutches, transmissions,—or any parts therefor. Foundry for aluminum crankcases, bronzes and bearing metals. Unusual type of service.

LIGHT
Manufacturing and Foundry Co.
Pottstown, Penna.

You can find it;

You can sell it;

Use a Broadcaster

Ad to tell it.

Barty Parts Make a Better Axle



—they act as a differential semi-lock which makes your axle essentially a solid axle on straightaways and allows the differential to function at the turns. Simple, easily installed. Adding very little to production costs. Get the details.

Barty Axle Corp.
Syracuse, N. Y.

**BARTY
CONTROL
PARTS**

Powell Muffler

Standard on
89 Cars and
Trucks



POWELL MUFFLER CO.
UTICA, N.Y.



**BRASS
COPPER
BRONZE**

Sheets; tubes; rods; electrical copper; rivets and bars.

ROME BRASS & COPPER COMPANY - ROME N.Y.



**Curtis Pneumatic
Machinery Co.**

1545 Kienlen Ave.
St. Louis, Mo.

The Warner & Swasey Company

Cleveland, U. S. A.

Manufacture

Turret Lathes and Tools for Them

Do Your Diesinking on a JACKSON

and save 25 to 75 per cent of cost of dies. Made in 3 sizes,
No. 5, No. 6, No. 10.

Prompt delivery made by

WALCOTT LATHE COMPANY

305 Calhoun Street

Jackson, Mich.

60a

MINUTE

Lipe Gear Tooth Chamfering Machine

Points gear teeth accurately at the rate of 60 per minute. Also adaptable to Automatic Indexed, Drilling, Reaming, Counterboring, etc. Used in big plants. Write for details.

W. C. Lipe, 208 So. Geddes St., Syracuse, N. Y.



Brass — Copper — Steel —
Gasoline Lines, Radiators,
Choke Tubes. Sizes 5/32" to 1/2".

Send for booklet.

BUNDY TUBING COMPANY

1113 Lafayette Bldg.,
Chicago

St. Louis

Detroit, Mich.
Cleveland

DURSTON TRANSMISSIONS

For passenger cars and trucks up to one-ton capacity. Investigate their adaptability to your requirements.

DURSTON GEAR CORPORATION
18 Maltbie St. SYRACUSE, N. Y.



VAN METAL WHEELS

Built in quarter sections. wheels and strong enough perfectly balanced. for the hardest service. Lighter than other metal. Ask for details.

VAN WHEEL CORP. Oneida, N. Y.



VALVES

Good Material—Nickel Gray Iron. Stem Material—S.A.E. 1020. Cold Drawn Steel.

Send your blueprints and specifications for quotations.
Gilliland Elec. & Mfg. Corp.
Hanover, Pa.

Long Life without decrease in efficiency

ROME RADIATORS

Write and ask us to tell you more about Rome Radiators

Rome-Turney Radiator Co., Rome, New York

HIGHLY SPECIALIZED METALS

Bulldog Metal Welds Aluminum and alloys at low temperature. Simplifies equipment and eliminates pre-heating. Use no flux. Joints have tensile strength up to 42,000 lbs. per sq. in. Dresses down well. Invaluable to Automobile and Body Builders.

Bulldog Cast-Iron Solder Pure metal alloy. No phosphorus, sulphur or enclosed flux. Tins easily. Ideal for water-jackets. Send for samples, prices and literature.

Marshall Metal Corp., 111 West Jackson Blvd., Chicago, Ill., U. S. A.

WRIGHT Dieing Machines

"Viktor" Drilling Machines

Both new and revolutionary in design and construction. Catalogs gladly sent.

HENRY & WRIGHT MFG. CO.

Hartford, Conn.

DAVIS Key-Seaters

AND CUTTERS

for cutting internal keyways. Does not use a circular cutter, but operates like a broach. Faster, more economical. Made in two sizes. Catalog.

DAVIS KEYSEATER CO.

255 Mill St.

Rochester, N. Y.

Ask
Us About
Our Cylinder
Internal and
Surface

Grinders



HEALD Co.
MACHINE CO.
11 New Bond St.
Worcester,
Mass.

MAGNETIC CHUCKS



GENUINE

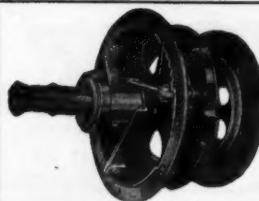
BOSCH

Products bear this Trade Mark

American Bosch Magneto Corporation

Main Office and Works: Springfield, Mass.

Trade Mark Reg. U. S. Pat. Off. Branches: New York, Chicago, Detroit, San Francisco. 800 Service Stations 1600 Official Dealers



New Type "M & E" Clutch

The Flexible

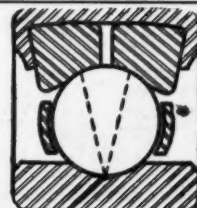
Smooth Action

Low Cost

Merchant & Evans Co., Phila.

Schatz UNIVERSAL Annular BALL BEARINGS

The Federal Bearings Co., Inc.
Poughkeepsie, N. Y.



Thirty-seven
BRANCHES

AHLBERG BEARING COMPANY
321 EAST TWENTY NINTH STREET, CHICAGO ILLINOIS

OREM Air Cleaner

The Orem Motor Protector represents a logical idea scientifically developed. It is the result of three years experimentation and trial with every conceivable type of air cleaner. Our tests in actual operation has proved that the OREM MOTOR PROTECTOR is the most efficient device possible. Laboratory tests have shown it to be 99.5% efficient. Its action is entirely automatic. It requires no attention of any kind, it is fool proof, it is noiseless, no moving parts, easy to install. May we figure on your requirements or send further information?

THE OREM MOTOR PROTECTOR COMPANY
2827 Calvert St. Baltimore, Md.

RIVETING REVOLUTIONIZED

High Speed Hammers head rivets cold, tight or loose, flush, counter-sunk or finish heads any shape desired. Built in nine sizes to handle rivets up to 1 1/4" diameter. Send us sample assembly with rivets or sketch of the work and let us shoulder your riveting problems.

The HIGH SPEED HAMMER COMPANY, Inc.
ROCHESTER, N. Y.

HIRST-ROGER CARPETS FOR CARS

Quality carpets that retain their pile and beauty and freshness even under abusive treatment. Buy where quality is assured.

THE HIRST-ROGER CO.
Philadelphia, Pa.
Detroit Representative
Joseph H. Austin Co.
New York Representative
Chas. Scott & Co.
17 W. 60th St.



Laugh at the Weather

"Every Day a perfect Drying Day," with Dry-Sys Equipment. For more information see our 1/4-page ad every 4th week, or send for Bulletin D14.

DRYING SYSTEMS, Inc.
11 South Desplaines St., Chicago, Illinois 2488



Complete stock of felts of our manufacture and conforming to S. A. E. recommended practice are carried at our modern cutting plant in Detroit, insuring prompt delivery of felt channels, cut and formed parts of every description.

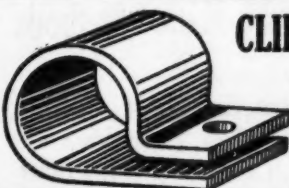
AMERICAN FELT CO. Boston Chicago St. Louis San Francisco
Detroit New York Philadelphia Cincinnati



High production rates on intricate castings. Aluminum, Zinc, Tin and Lead-base alloys.

Send blueprints or samples for quotations

ALEMITE DIE CASTING & MFG. CO.
2640-54 Belmont Ave.
Chicago, U. S. A.



CLIPS FROM THE CLIP HOUSE

Standard wire and tubing clips from 3/16 to 1". At lowest prices on short notices. Samples sent on request. Light stampings, formed and shallow drawn parts in brass, aluminum, copper and steel. Send your inquiries and blue prints. Kieckhafer Mfg. Company
359 Reed St. Milwaukee, Wis.

POLISHING BUMPERS

We lay out, furnish and install everything from the bare floor to the last process, and, if desired, will furnish competent engineers to start the work right and put you on a proper production basis.

WE HAVE BEEN DOING THIS FOR 30 YEARS.

The whole polishing business is in such vague condition that many large concerns have found that it paid them to have our engineers standardize their processes.

Divine Brothers Company, Polishing Engineers, Utica, N. Y.

Link-Belt Silent Chain Front End Drive

Makes a Quiet-running Motor.

LINK-BELT COMPANY INDIANAPOLIS

CARBURETOR

FLOATS
AND
STRAINERS

AND

LIGHT AUTOMOTIVE STAMPINGS

GOODNOW & BLAKE MFG. CO.
3840 Beaver St., Detroit, Mich.

Better

Methods



Better

Die Castings

THE SUPERIOR DIE CASTING CO.

Cleveland

Ohio



About
better machine screws

See our 1/2-page advertisement in last week's issue.

HARVEY HUBBELL, Inc., Bridgeport, Conn.

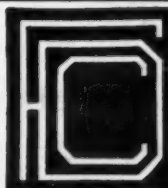


MAR TAN MOTORS

AIR COOLED—LIGHT WEIGHT
SINGLE AND TWIN

Specially adapted to garden tractors, cultivators, railway speeders and light cars; 4-6 and 10-14 H.P. Correct design; mechanically perfect; well built. Specifications and details on request.

MAR TAN MOTOR MFG. CO., 38 S. Dearborn St., Chicago



FRANKLIN DIE-CASTINGS

Increase Production—Improve Quality—Reduce Cost

Our range includes aluminum, tin, lead and zinc base alloys. We quote from sample or blue-print.

Send for our two useful booklets.

FRANKLIN DIE-CASTING CORPORATION, Syracuse, N. Y.



TOLEDO VALVES

Valves Exclusively for over 9 Years



THE TOLEDO STEEL PRODUCTS COMPANY • TOLEDO • OHIO

Thermoid-Hardy Universal Joint

A FABRIC JOINT THAT OUTLASTS METAL
ABSORBS JOLTS—NO OIL OR CARE.

CABLES of QUALITY*The Packard*Standard since the beginning of
the industry.*Electric Company*WARREN,
OHIO**Titeflex**FLEXIBLE without sliding joints.
TIGHT without packing.Write for literature and submit specifications for your metal
tubing requirements on automobiles, trucks and tractors.

TITEFLEX METAL HOSE CO.

Badger Ave. & Runyon St.

Newark, N. J.

BROWN & SHARPEMilling, Grinding, Gear Cutting, Screw Machines
Cutters and Hobs Machinists' Tools

GEARS CUT TO ORDER

BROWN & SHARPE MFG. CO., Providence, R. I., U. S. A.

Closed Car
Cloths
Curtain Silks
Carpets
Laces and
Trimmings**The LAIDLAW
COMPANY, Inc.**16 West 60th St.
New York City

Detroit Chicago San Francisco

Top Coverings
Slip Cover
Cloths
Hair Carpets
Closed Car
Roofing
Materials**Lycoming**
MOTORS

Fine Fours and Eights-in-Line

Lycoming Manufacturing Company, Williamsport, Pa.

STEELBars Shapes
Rails Boiler Tubes
Plates Reinforcing Steel
Sheets for Concrete
Small Tools, etc.
Immediate Shipment

Write for Stock List.

JOSEPH T. RYERSON & SON INC.

Chicago St. Louis Cincinnati Detroit Buffalo New York

Bush radiators

for trucks, tractors and airplanes

Bush Manufacturing Co.

Hartford, Conn.

ACCURATE-CASTACCURATE BRASS CASTINGS look like DIE castings but are
several times stronger. Accurate within .005 per inch. Need
for machining cut 75%. Many large automotive users. Send
B/P for estimating.ACCURATE BRASS CASTING CO., INC.
345 Cooper Street Brooklyn, N. Y.**DETROIT****CENTERLESS GRINDERS
SEMI-AUTOMATIC DRILLERS**

DETROIT MACHINE TOOL CO.

6847 St. Antoine St.

Detroit, Mich.



TRADE MARK

GEARS

"The Finest in Gear Quality"

Meisel Press Manufacturing Co.

942 Dorchester Ave., Boston 25, Mass.

**McGILL
METAL**

Die Castings



ALUMINUM BRONZE—HARD AS STEEL

Positively successful for "less-than-pound" parts

Send sample or blue prints for quotations

McGILL METAL COMPANY, VALPARAISO, IND.

ZENITH
CARBURETORMore
Power
Less
Fuel

Zenith-Detroit Corporation, Detroit, Mich.

BULLARD**Mult-Au-Matic Methods**

are

Constructive Cost Cutting

THE BULLARD MACHINE TOOL COMPANY

BRIDGEPORT

CONNECTICUT

**Bosch**Robert Bosch Magneto and Spark Plugs hold more
racing records than all other makes combined.

ROBERT BOSCH MAGNETO CO., Inc.

The Genuine Original Bosch

Otto Heins, Pres., 123 West 64th St., New York

Boyce & Veeder Co., Inc.
Long Island City, N. Y.**Boyce-ite**
TREATED
GasolineManufacturers of
Boyce-ite exclusively

"THE ONLY FUEL FIT FOR YOUR MOTOR"

The Broadcaster

A Department that will Find What You Want

EMPLOYMENT SERVICE

SALARIED POSITIONS, \$3,000 to \$25,000 upward, all lines. If you are now earning between these figures and are desirous of considering new connections, communicate with the undersigned, who will negotiate preliminaries. A method is provided through which you may receive overtures in confidence, without jeopardizing present connections. (A confidential correspondence service, not an employment agency. Established 1910.) Send name and address only for particulars. R. W. Bixby, Inc., 521 Lockwood Building, Buffalo, New York.

EXECUTIVES, ENGINEERS, \$3,000—\$25,000 will find our individual, confidential service an effective medium in making connections desired. Since 1919 personally conducted by MR. JACOB PENN, the eminent employment authority, known to leading business men throughout America. Not employment agency. Jacob Penn, Inc., 305 Broadway, New York.

EMPLOYMENT AGENCY

WANTED—Draftsmen, designers, experienced, all lines, also young graduate engineers. Cleveland Engineering Agency, 904 Rose Bldg., Cleveland, Ohio.

FOR SALE

Parts for Autos and Trucks

WHAT do you need? We have it. Gray's Auto Parts Company, 3212 Brighton Rd., Pittsburgh, Penna.

SACRIFICE 90 C.A.S. Steering Wheel Assemblies. Cost \$14 each. Will sacrifice for \$3 each. Fantus, 1321 South Oakley, Chicago.

PATENT ATTORNEY

AUTOMOTIVE PATENTS

SPECIALIZED service for Power and Automobile Inventors. M. P. LAUGHLIN, 47 WEST 42nd STREET, NEW YORK.

Attorney-at-Law and Solicitor of Patents
Formerly Member Examining Corps, United States Patent Office

C. L. PARKER

American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request.
McGill Building, WASHINGTON, D. C.

WE SPECIALIZE IN
Stampings Screw Machine Products
Machines, Parts, Specialties, Machine Work, Assembly, Dies, Special Tools, Patterns. Ask for quotations on your requirements.
MINER-ROBEY
MANUFACTURING & TOOL WORKS
1115-1117 Twenty-third Street
Milwaukee, Wis.

HUB CAP AND SPARK PLUG WRENCHES; SPECIAL SOCKET AND FLAT WRENCHES; METAL STAMPINGS OF ALL KINDS.
New England Pressed Steel Co.
NATICK, MASS.
Detroit Office: 4835 Woodward Avenue.

INFORMATION

Six cents a word is the rate for all undisplayed advertisements set solid, regular want ad style; all capitals, 9c. a word; all capitals leaded, 12c. a word; minimum charge \$1 an insertion; payable in advance (see next paragraph).

Ten per cent discount if one payment is made in advance for four or more consecutive insertions. Advertisements other than "Positions Wanted" will be billed monthly if run more than four times.

Add five words for address if replies are to come to a box number address at any of our offices. These replies are forwarded each day as received, in new envelopes, at no extra charge.

Refund will be made if all insertions ordered are not needed, the amount refunded being the difference between cost of insertions given and full amount paid.

Telephone orders must be confirmed in writing same day. No allowances can be made for errors of any kind unless prompt notification is sent us.

When replying to blind ads be careful to put on your envelope the correct box number and do not enclose original letters of recommendation—send copies.

Displayed advertisements are sold by the inch. Rates will be furnished upon application.

The right is reserved to refuse any advertisement and also to rewrite and edit copy furnished whenever the publishers consider it advisable to do this.

THE BROADCASTER

THE CLASS JOURNAL COMPANY

229 W. 39th St., New York
5 S. Wabash Ave., Chicago

Our Factory Is at Your Service

for the manufacture on contract of any small metal, fibre or wood parts, or for completely assembled mechanisms of any kind.

We have the best of facilities for this kind of production, and also a well equipped tool-room for making such punches and dies that may be necessary.

Send us prints, sketches and details and we will quote promptly.

THE C. SPIRO MFG. CO.

Dobbs Ferry, New York
(Suburb of N. Y. City)



HIGH-GRADE

Jigs, Fixtures, Dies, Gauges and Special Machines

Send for Free Illustrated Prospectus

MEHL MACHINE TOOL & DIE CO.

ROSELLE, N. J.

Established 1913

30 Minutes from New York City

METAL STAMPINGS



Light and Heavy Quality Stampings To Order

Worcester Stamped Metal Company
Worcester, Mass.

CERTIFIED MALLEABLE IRON CASTINGS

High Grade Clean CASTINGS

TEMPLE MALLEABLE IRON & STEEL COMPANY
Foundry: Temple, Pa. Office: 312 Harrison Bldg., Philadelphia, Pa.

MACHINE WORK

LIGHT, ACCURATE MACHINE WORK
CONTRACT MANUFACTURING

York Electric & Machine Co.
30-34 N. Penn St. YORK, PA.

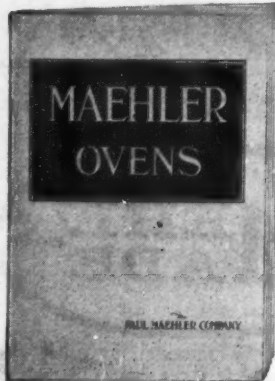
Brass—Bronze—Aluminum CASTINGS

Our Foundry Has Been in Continuous Operation Since 1850
400 S ADAMS Kinsey & Mahler Co. PEORIA ILLINOIS

The Broadcaster will search the entire industry for you — and it will find what you want.

LIGHT GRAY IRON AND SEMI STEEL
CASTINGS
The Fremont Foundry Co.
FREMONT, OHIO

Built to Fit as Well as Serve



"Maehler Ovens" is one of the most comprehensive oven booklets ever printed. Though you may not be in the market now you need this catalog for reference. Copy on request.

MAEHLER OVENS for japanning, enameling, tempering, core drying or small parts baking are designed and built to fit the production schedules and building plans of the plant in which they are installed.

We have designed, built and installed some of the most unusual oven departments in the automotive industry.

Think of Maehler in terms of superior construction, low operating costs, and high performance records.

The
PAUL MAEHLER COMPANY
INDUSTRIAL OVEN BUILDERS
2214 WEST LAKE ST., CHICAGO, ILL.

Counts 'Em Right



Good-bye
Guess Work

Good-bye
Inaccuracy

The Productimeter

The Speedometer of Industry

The minute you put a Productimeter on a machine you can bid guess work good-bye. It tells at a glance exactly what every man and what every machine is producing. Then, too—it will speed up production because the good workman wants to beat yesterday's record, and that establishes standards for all the rest of the force to follow.

Let us put a Productimeter on one of your machines for a month's trial. You'll see the difference almost from the start.

DURANT *Manufacturing Company*

631 Buffum St.

Milwaukee, Wis.

Index to Advertisers

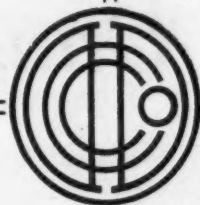
The Advertisers' Index is published as a convenience, and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A	F
Accurate Brass Castings Co. 92	Federal Bearings Co. 90
Acklin Stamping Co. 88	Federal Mach. & Weld. Co. 81
Aetna Ball Bear. Mfg. Co. 89	Fellows Gear Shaper Co. . 62
Aga Auto Lamp Co. 83	Fitchburg Machine Works. 88
Ahlberg Bearing Co. 90	Franklin Die Casting Corp. 91
Alemite Die Casting & Mfg. Co. 91	Fremont Fdry. Co. 93
American Felt Co. 91	
Amer. Sheet & Tin Plate Co. 86	G
American Steel & Wire Co. 86	General Electric Co. 64
Armitage & Co., John L. 88	Gibson Co., Wm. D. 78
	Gilliam Mfg. Co. 7
B	Gilliard Elec. & Mfg. Corp. 90
Bakelite Corp. 88	Gits Bros. Mfg. Co. 85
Baker R. & L. Co. 73	Globe Steel Abrasive Co. . 89
Barnes Drill Co. 87	Globe Steel Tubes Co. 78
Barty Axle Corp. 89	Goodnow & Blake Mfg. Co. 91
Bearings Co. of America. 87	
Bliss Co., E. W. 76	H
Bosch Magneto Co., Robt. 92	Heald Machine Co. 90
Bosch Magnetic Corp., American 90	Henry & Wright Mfg. Co. 90
Bossert Corp. 89	High Speed Hammer Co. 91
Bowen Products Corp. 88	Hinkley Motors, Inc. 82
Bower Roller Bearing Co. 84	Hirst Roger Co. 91
Boyce & Veeder Co., Inc. 92	Hoover Steel Ball Co. 82
Broadcaster 93	Hubbell, Inc., Harvey. . 91
Brown & Sharpe Mfg. Co. 92	Hyatt Roller Bearing Co. . 60
Brown Mfg. Co., Jno. W. 86	
Bryant Chuck Grinder Co. 89	I
Bullard Machine Tool Co. 92	Ingersoll-Rand Co. 70
Bundy Tubing Co. 90	
Bush Mfg. Co. 92	J
	Canton Forge & Axle Co. . 88
C	Carnegie Steel Co. 87
Canton Forge & Axle Co. . 88	Central Steel Co. 71
Carnegie Steel Co. 87	Chicago Fuse Mfg. Co. 87
Central Steel Co. 71	Concealed Door Check Co. 87
Chicago Fuse Mfg. Co. 87	Crescent Tool Co. 81
Concealed Door Check Co. 87	Curtis Pneu. Mach. Co. 89
Crescent Tool Co. 81	
Curtis Pneu. Mach. Co. 89	D
	Davis Keyseater Co. 90
D	Detroit Carrier & Mfg. Co. 85
Davis Keyseater Co. 90	Detroit Machine Tool Co. 92
Detroit Carrier & Mfg. Co. 85	Diamond State Fibre Co. . 68
Detroit Machine Tool Co. 92	Divine Bros. Co. 91
Diamond State Fibre Co. . 68	Dixon Crucible Co., Jos. . 79
Divine Bros. Co. 91	Doehler Die Casting Co. . 95
Dixon Crucible Co., Jos. . 79	Dow Chemical Co. 89
Doehler Die Casting Co. . 95	Drying Systems, Inc. 91
Dow Chemical Co. 89	Durant Mfg. Co. 94
Drying Systems, Inc. 91	Durston Gear Corp. 90
Durant Mfg. Co. 94	
Durston Gear Corp. 90	E
	Elwell-Parker Elec. Co. 88
E	
Elwell-Parker Elec. Co. 88	F
	Federal Bearings Co. 90
F	Federal Mach. & Weld. Co. 81
Federal Bearings Co. 90	Fellows Gear Shaper Co. . 62
Federal Mach. & Weld. Co. 81	Fitchburg Machine Works. 88
Fellows Gear Shaper Co. . 62	Franklin Die Casting Corp. 91
Fitchburg Machine Works. 88	Fremont Fdry. Co. 93
Franklin Die Casting Corp. 91	
Fremont Fdry. Co. 93	G
	General Electric Co. 64
G	Gibson Co., Wm. D. 78
General Electric Co. 64	Gilliam Mfg. Co. 7
Gibson Co., Wm. D. 78	Gilliard Elec. & Mfg. Corp. 90
Gilliam Mfg. Co. 7	Gits Bros. Mfg. Co. 85
Gilliard Elec. & Mfg. Corp. 90	Globe Steel Abrasive Co. . 89
Gits Bros. Mfg. Co. 85	Globe Steel Tubes Co. 78
Globe Steel Abrasive Co. . 89	Goodnow & Blake Mfg. Co. 91
Globe Steel Tubes Co. 78	
Goodnow & Blake Mfg. Co. 91	H
	Heald Machine Co. 90
H	Henry & Wright Mfg. Co. 90
Heald Machine Co. 90	High Speed Hammer Co. 91
Henry & Wright Mfg. Co. 90	Hinkley Motors, Inc. 82
High Speed Hammer Co. 91	Hirst Roger Co. 91
Hinkley Motors, Inc. 82	Hoover Steel Ball Co. 82
Hirst Roger Co. 91	Hubbell, Inc., Harvey. . 91
Hoover Steel Ball Co. 82	Hyatt Roller Bearing Co. . 60
Hubbell, Inc., Harvey. . 91	
Hyatt Roller Bearing Co. . 60	I
	Ingersoll-Rand Co. 70
I	
Ingersoll-Rand Co. 70	J
	Jones & Lamson Machine Co. 59
J	
Jones & Lamson Machine Co. 59	K
	Kickhaefer Mfg. Co. 91
K	Kinsey & Mahler Co. 93
Kickhaefer Mfg. Co. 91	
Kinsey & Mahler Co. 93	L
	Ladish Drop Forge Co. 86
L	Laidlaw Co. 92
Ladish Drop Forge Co. 86	Lakeside Mall. Cast. Co. . 88
Laidlaw Co. 92	Lancaster Steel Products Corp. 79
Lakeside Mall. Cast. Co. . 88	Landis Tool Co. 66-67
Lancaster Steel Products Corp. 79	Lapointe Co., J. N. 92
Landis Tool Co. 66-67	LeBlond Machine Tool Co. 84
Lapointe Co., J. N. 92	Light Mfg. & Foundry Co. 89
LeBlond Machine Tool Co. 84	Link-Belt Co. 91
Light Mfg. & Foundry Co. 89	Lipe, W. C. 90
Link-Belt Co. 91	Lukens Steel Co. 80
Lipe, W. C. 90	Lycoming Mfg. Co. 92
Lukens Steel Co. 80	
Lycoming Mfg. Co. 92	

Index to Advertisers

The Advertisers' Index is published as a convenience, and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

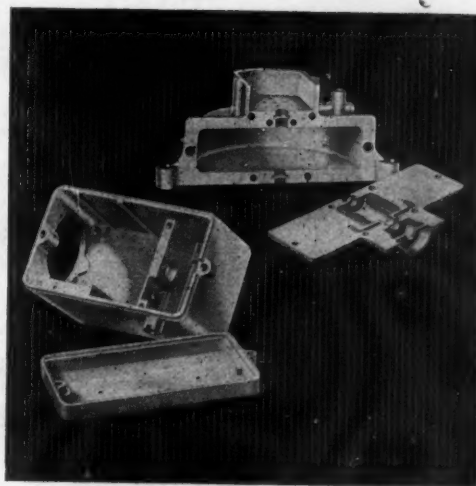
M		Shafer Bearing Corp..... 83
McGill Metal Co..... 92		Soss Mfg. Co..... 89
Maehler & Co., Paul..... 94		Spiro Mfg. Co..... 93
Mar Tan Motor Mfg. Co.. 91		Steel Products Co..... 87
Marshall Metal Corp..... 90		Superior Die Casting Co.. 91
Meachem Gear Corp..... 88		
Mehl Mach. Tool & Die Co. 93		
Meisel Press Mfg. Co..... 92		
Merchant & Evans Co.... 90		
Milwaukee Die Casting Co. 4		
Miner-Robey Mfg. & Tool Works 93		
Morse Chain Co..... 77		
Mount Carmel Mfg. Co... ?		
N		
National Acme Co..... 65		
New Departure Mfg. Co.. 72		
New Eng. Pressed Steel Co. 93		
Norma Co. of America... 3		
O		
Oakley Chemical Co..... 69		
Oesterlein Machine Co... 91		
Orem Motor Protector Co. 91		
Otis Steel Co..... 88		
P		
Packard Electric Co..... 92		
Park Drop Forge Co..... 86		
Peck Spring Co..... 86		
Phosphor Bronze Smelting Co. 82		
Piston Ring Co..... 1		
Powell Muffler Co..... 89		
Progressive Mfg. Co..... 88		
R		
Raymond Mfg. Co., Ltd... 78		
Richards-Wilcox Mfg. Co.. 96		
Rockford Drill Mach. Co.. 88		
Rockford Mall. Iron Wks. 88		
Rome Brass & Copper Co. 89		
Rome Mfg. Co..... 88		
Rome Turney Radiator Co. 90		
Russell, Burdall & Ward Bolt & Nut Co..... 75		
Ryerson & Sons, Jos. T... 92		
S		
S K F Industries, Inc.... 8		
Sargent & Co..... 83		
Schlegel Mfg. Co..... 6		
T		
Taylor Instrument Co.... 87		
Temple Mall. Iron & Steel Co. 93		
Ternstedt Mfg. Co. Second Cover		
Thermoid Rubber Co.... 91		
Thomson Spot Welder Co. 80		
Tillotson Mfg. Co. Back Cover		
Timken Roller Bearing Co. Front Cover		
Titeflex Metal Hose Co.. 92		
Toledo General Mfg. Co.. 89		
Toledo Steel Products Co. 91		
Townsend Co..... 84		
U		
Union Drawn Steel Co... 85		
V		
Vacuum Oil Co..... 88		
Vanadium Corp. of Amer.. 88		
Van Dorn Electric Tool Co. 63		
Van Wheel Corp..... 90		
W		
Walcott Lathe Co..... 90		
Walden-Worcester, Inc... 89		
Wallace Barnes Co..... 78		
Warner & Swasey Co.... 90		
Waukesha Motor Co.... 86		
Western Felt Works Third Cover		
Wheeler-Schebler Carburetor Co..... 5		
Wisconsin Motor Mfg. Co. 61		
Wor. Stamp Metal Co.... 93		
Wyman-Gordon 2		
Y		
York Corrugating Co.... 87		
York Elec. & Mach. Co... 93		
Z		
Zenith-Detroit Corp..... 92		



DOEHLER

The World's Largest Producer of

DIE-CASTINGS



The purchase of a die-casting is an investment in serviceability—the returns upon which will appear in the manner in which that part performs its functions.

Its ability to perform properly—to render the service expected under the conditions encountered—is determined by the foreknowledge of these conditions which its designer and producer has or can secure by cooperation with its users.

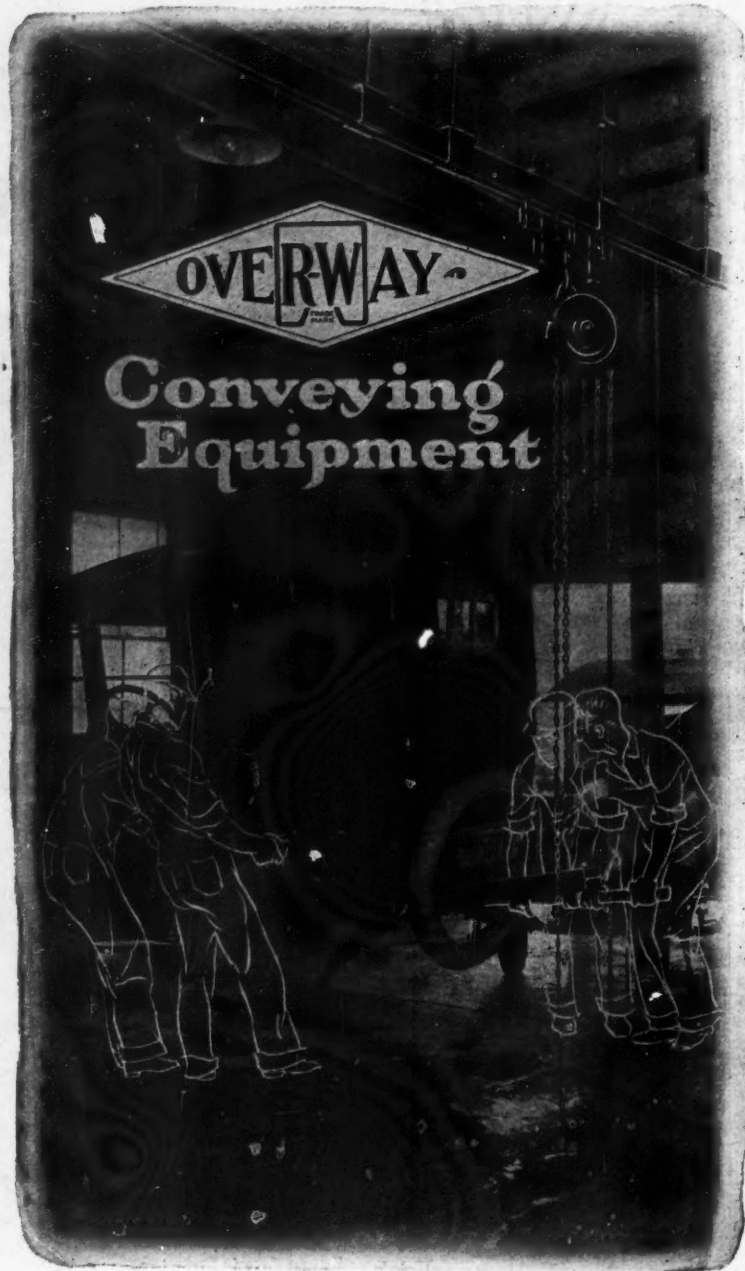
Each Doehler-Die-Casting has—incorporated within it—that comprehensive knowledge of how best to use, as well as how best to make, die-castings which can be expected from the world's largest producer of die-castings.

DOEHLER DIE-CASTING CO.
BROOKLYN, N. Y. TOLEDO, OHIO.
POTTSTOWN, PA. BATAVIA, N. Y.



An Extra Gang for Every Shop

*at the cost of
one man's time*



In this Over-Way equipped garage, one man can easily handle the heaviest loads. Over-Way is ideal for transporting heavy motors and for holding up cars when repairs necessitate the removal of axles.

A surprisingly large number of leading manufacturers still follow the wasteful practice of maintaining extra gangs to care for heavy handling jobs. And in many smaller factories, machine shops and garages, highly-paid mechanics are frequently taken from productive tasks to do a laborer's work.

Progressive manufacturers, however, have long since found that Over-Way has every advantage over the "gang-way" of doing heavy handling. With Over-Way in your factory or shop, one man can easily care for handling jobs that formerly required from four to six men.

By multiplying your man power, Over-Way speeds up production and noticeably lowers your costs. It also economizes on storage space by permitting higher piling. No matter what your handling problem may be, we can suggest an Over-Way system that will repeatedly pay for itself.

Free Engineering Service to Manufacturers

Our Engineering Department stands ready to show you how Over-Way can be adapted to your particular requirements, and submit complete plans, specifications and estimated savings. This service is given without cost or obligation. Write today for further particulars and a copy of Catalog W-23.

New York
Boston
Philadelphia
Cleveland
Cincinnati
Indianapolis
St. Louis

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

AURORA, ILLINOIS, U.S.A.

RICHARDS-WILCOX CANADIAN CO., LTD.
Winnipeg LONDON, ONT. Montreal

Chicago
Minneapolis
Omaha
Kansas City
Los Angeles
San Francisco
Seattle

(909)



Oil Retaining Washers
—each designed for its
special purpose and
made of

Western Felts

"Cut by the Maker"

Whether it be for lubricating the tappets on overhead valve engines, for retaining the grease in axles or transmissions, or for other purposes best served by felt, you will find a great deal of value in recommendations we might make.

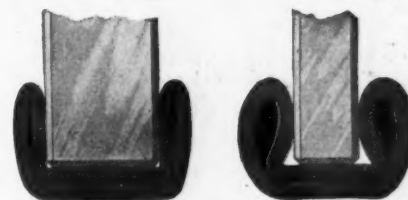
For we are supplying the schedule needs of some of the most exacting producers in the industry today and have been highly successful in delivering felt washers and wicks 100% up to their requirements.

The highly specialized development of the products shown is an indication of the service you will receive here. A well organized service with every operation under one, centralized control.

Your inquiries will be promptly attended to.

WESTERN FELT WORKS

Factory and General Offices
4031-4117 Ogden Avenue
Chicago



Western Folded Channel

Closed body builders find that this *Folded Channel*, which comes cut to exact size ready to tack in place, is not only reducing production costs but, because of the elasticity given by the air chambers shown, they are able to use a great deal of glass which would be rejected if ordinary channel were used.

Western Felt is also made in a **waterproof** grade for use on wind-shields, rear windows, etc.

Samples and prices will be sent promptly on receipt of specifications.

Branches

42-44 E. 20th St. New York	Union Trust Bldg. Detroit
10 High St. Boston	Postal Telegraph Bldg. San Francisco
Finance Bldg. Cleveland	Odd Fellows Bldg. St. Louis



Toe Board Gaskets

Endorsed by leading makers who have found that their use gives the Sales Department additional ammunition. They keep out the heat and dust of Summer as well as the cold of Winter. Cut to any exact fit from exactly the right felt.

Write for samples and prices.

TILLOTSON

Ask for a Test
In Your Own Plant!

EVERY seventh car that America produces is now Tillotson-equipped. This year, car manufacturers will demand nearly half a million Tillotson Carburetors.

Tillotson Carburetors are daily establishing new mileage economy records for Tillotson-equipped cars.

The new Tillotson non-air-valve carburetor meets every requirement for quick starting, smooth action and gasoline economy. Improves the performance of *any* motor. Extracts and utilizes every ounce of pep and power from every drop of gasoline it feeds to the cylinders.

Tillotson performance makes permanent, satisfied car-owners for the manufacturers of Tillotson-equipped cars.

Increased production gives *you* Tillotson advantages at a saving.

TILLOTSON MANUFACTURING CO.
Toledo Ohio

CARBURETOR

